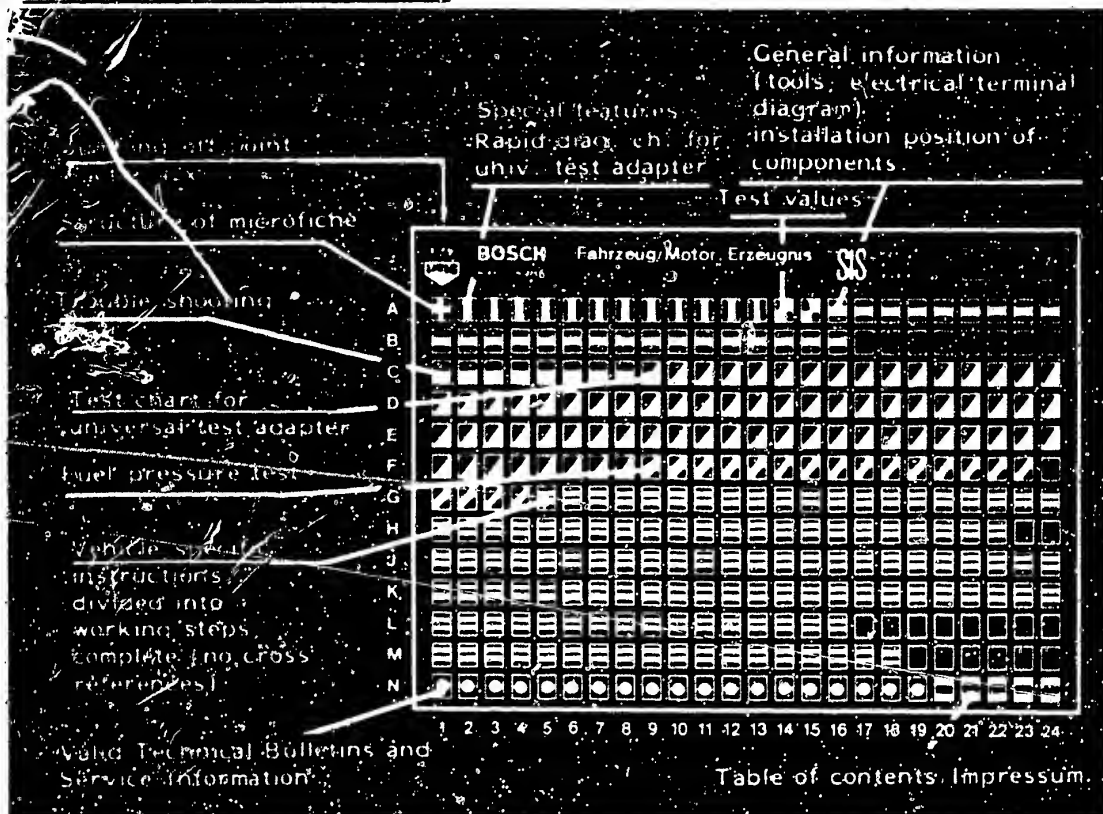


Structure of microfiche

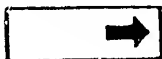


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

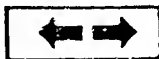
E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1

Trouble-shooting program



This microcard contains the LH-Jetronic trouble-shooting instructions for the following SAAB models valid at press time:
SAAB 900 Turbo, 2.0l/4-cyl. engine 16 valve (8.84 →), USA version

SPECIAL FEATURES

- O-ring connection of solenoid-operated injection valves
- Cutoff valve: equalizes high dynamic pressure before hot-wire air-mass sensor when accelerator is released.
- Exhaust turbo-supercharging with charge cooling.
- Knock control (Saab Co. APC system).
- Mechanical throttle valve damper. Damper causes a mechanical braking of throttle plate motion during closing.
- Fuel cutoff during starting. When starting motor is actuated, fuel supply is cut off, when gas pedal is depressed to full throttle position.
- Lambda closed-loop control with heated sensor
- Until 7.85: Saab 900 Turbo 16V US with control unit
0 280 000 515
From 8.85: Saab 900 Turbo 16V US with control unit
0 280 000 537
t₀ triggering and data coding
- Plug connections are secured with a bracket. To release, press bracket down.

Testing:

For testing the LH 2.2-Jetronic with the universal test adapter, a Y adapter lead is required for testing peripheral and control units.



RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER









The following rapid diagnosis chart offers the experienced L-Jetronic specialist the means of rapidly testing the electric components of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Test step sequence
- Position of V and Ω program switch
- Notes on operating universal test adapter or other components.
- Test specifications for motortester and multimeter
- Information on coordinates of the respective detailed test and trouble-shooting programs.



Rapid Diagnosis Chart for Universal Test Adapter

Test Step	Switch Position		Measurement	Note Connect adapter lead only to peripherals.	Test Specifications (Reading)	Trouble-shooting see Coordinates
	V	Ω				
1		5	Resistance of temperature sensor NTC II. At control unit plug between term. 2 and term. 11	---	(+15°C...+30°): <u>1.45 3.3 kΩ</u> (+80°C): <u>280 ... 360 Ω</u>	C 12
2		6	Ground output stage resistance. At control unit plug between term. 25 and term. 11	----	<u>0 ... 10 Ω</u>	C 14
3		7	Sensors ground resistance. At control unit plug between term. 5 and term. 11	----	<u>0 ... 10 Ω</u>	C 16
4		8	Resistance of all 4 parallel-connected injection valves and sensor heating in series. At control unit plug between term. 13 and term. 11.	Remove sensor heating plug and carefully insert short-circuit wire bridge in plug (wiring-harness side)	(+15°C...+30°): <u>6.80 ... 9.30 Ω</u> (+80°C): <u>7.00 ... 9.80 Ω</u>	C 18
5		9	Resistance of idle contact in throttle-valve switch. At control unit plug between term. 3 and term. 11	Gas pedal in unoperated position	<u>0 ... 10 Ω</u>	C 22
6		10	Resistance of full-load contact in throttle-valve switch. At control unit plug between term. 12 and term. 11.	Depress gas pedal fully (full load)	<u>0 ... 10 Ω</u>	D 3
7		10	Idle-speed control test pin (1-pin plug). Near air intake interior, resistance at control unit plug between term. 12 and term. 11	Apply test pin to ground.	<u>0 ... 10 Ω</u>	D 3
8		11	Resistance of idle actuator (1st winding) and of electric fuel pump. At control unit plug between term. 10 and term. 11	---	(+15°C...+30°C): <u>20 ... 32 Ω</u> (+80°C): <u>24.5 ... 37.0 Ω</u>	D 7

A4

Rapid diagnosis chart
SAAB 900 Turbo USA



A5

Rapid diagnosis chart
SAAB 900 Turbo USA



Rapid Diagnosis Chart for Universal Test Adapter (continued)

<u>Test Step</u>	<u>Switch Position</u>		<u>Measurement</u>	<u>Note</u> Connect adapter lead only to peripherals	<u>Test specifications (Reading)</u>	<u>Trouble-shooting see Coordinates</u>
	V	Ω				
9	↓	12	Resistance of idle actuator (2nd winding) and of electric fuel pump. At control unit plug between term. 23 and term. 11	--	(+15°C...+30°C): 18 ... 9.5 Ω (+80°C) 22 ... 34 Ω	D 9
10	↓	14	Data coding At control unit plug between term. 19 and term. 11.	Bridge on control unit plug	0 ... 10 Ω	D 11
11	↓	21	Potentiometer for idle-mixture adjustment. Resistance at control unit plug term. 14 and term. 6	Dependent on CO adjustment	150 ... 600 Ω	D 3

A6

Rapid diagnosis chart
SAAB 900 Turbo USA



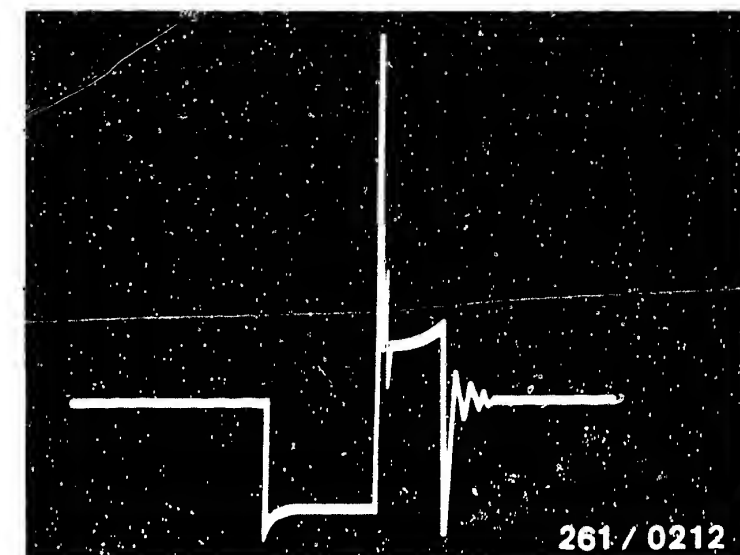
A7

Rapid diagnosis chart
SAAB 900 Turbo USA



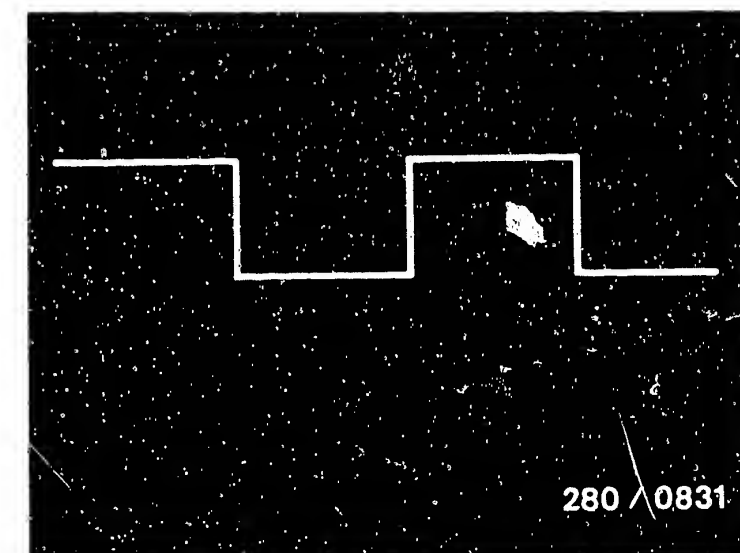
Rapid Diagnosis Chart for Universal Test Adapter (continued)

Test Step	Switch Position		Key	Measurement	Note	Test specifications (Reading)	Trouble-shooting see Coordinates
	V	Ω					
12	5	21	-	Voltage pulse from ignition coil term. 1 or t_p signal from ignition trigger box term. 1. At control unit plug between term. 1 and term. 11	Ignition "ON". Measure primary signal or t_p with oscilloscope. Disengage gear and start	Until 7.85: See upper figure from 8.85: see lower figure	D 15
13	6	21	4	Voltage from main relay term. 87. At control unit plug between term. 9 and term. 11.	Ignition "ON".	8 ... 15 V	D 19
14	7	21	-	Voltage from ignition coil term. 15. At control unit plug between term. 18 and term. 11	Ignition "ON".	8 ... 15 V	D 21
15	8	21		Voltage from main relay (winding) term. 85. At control unit plug between term. 21 and term. 11	Ignition "ON".	8 ... 15 V	D 23
16	9	21	4	Voltage at pump relay (winding) term. 85. At control unit plug between term. 17 and term. 11	Ignition "ON".	8 ... 15 V	E 1



until 7.85:
Term. 1 signal from term. 1 ignition (primary signal)

from 8.85
 t_p signal from ignition trigger box term. 1



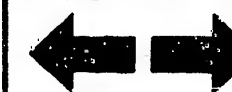
A8

Rapid diagnosis chart
SAAB 900 Turbo USA



A9

Rapid diagnosis chart
SAAB 900 Turbo USA



Rapid Diagnosis Chart for Universal Test Adapter (continued)

Test Step	Switch Position		Key	Measurement	Note	Test specifications (Reading)	Trouble-shooting see Coordinates
	V	Ω					
17	10	21	-	Voltage at A/C switch (when present). At control unit plug between term. 16 and term. 11	Connect adapter lead to peripherals and control unit. (Ignition "OFF"). Subsequently let engine warm up. Ignition "ON". Let engine run. Turn on air conditioning.	8... 15 V	E 3
18	3	21	-	Hot-wire air-mass sensor output voltage. At control unit plug be- tween term. 7 and term. 6.	Let engine run. When engine speed changes, output voltage must do likewise.	2 ... 5 V	E 5
19	11	21	-	Voltage measurement, lambda closed- loop control value. At control unit plug between term. 22 and term. 11.	Let engine run at operating temperature. Switch position 22, 23, and 24 disallowed. Separate sensor lead coupling.	10 ... 13 V	E 7
20	11	22	-	Voltage measurement, lambda closed- loop control (rich value). At con- trol unit plug between term. 22 and term. 11	Allow engine to run at operating temperature.	10 ... 13 V	E 9
21	11	23	-	Voltage measurement lambda closed- loop control (lean value). At con- trol unit plug between term. 22 and term. 11	Let engine run at operating temperature.	smaller than 0.5 V	E 11
22	11	24	-	Voltage measurement lambda closed- loop control (control value). At control unit plug term. 22 and term. 11	Let engine run at operating temperature. Connect sensor lead connection.	0 ... 13 V alternating between small and large value	E 13
23	11	24	-	If necessary, set basic idle setting to (1)	Let engine run at operating temperature. Read engine speed on motortester, load disconnected. (1) Connect test pin to ground.	775...925 min ⁻¹ (1) 750 min ⁻¹	E 17

A10

Rapid diagnosis chart

SAAB 900 Turbo USA



A11

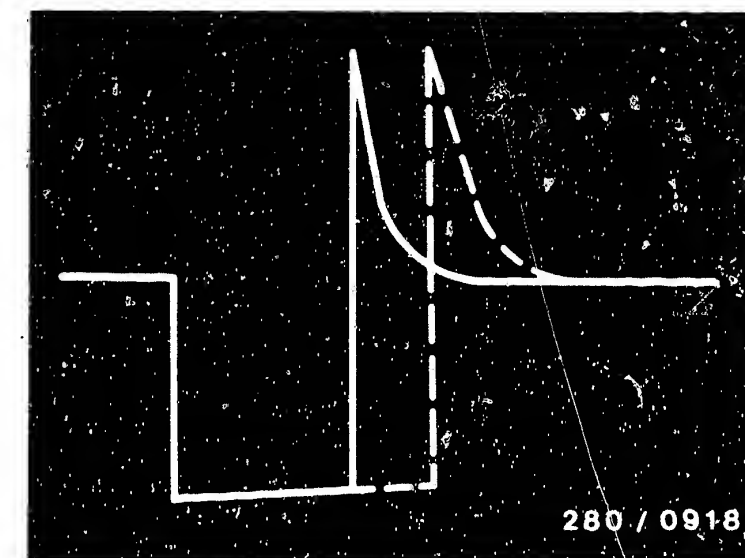
Rapid diagnosis chart

SAAB 900 Turbo USA



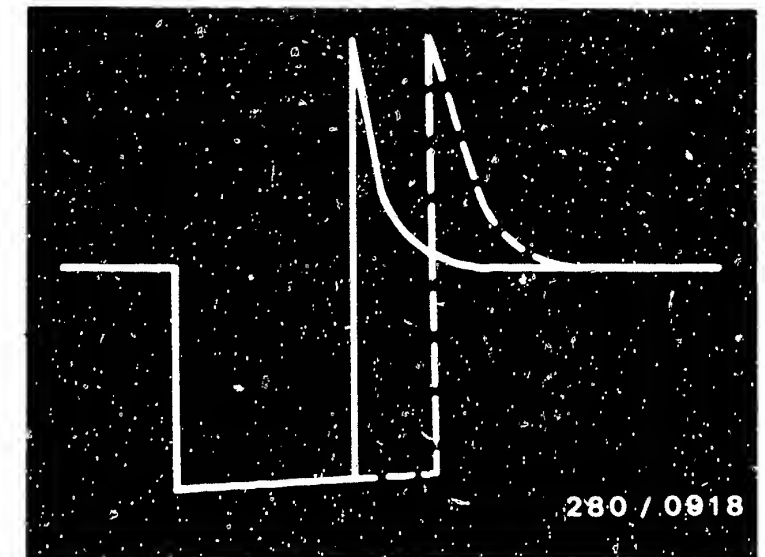
Rapid Diagnosis Chart for Universal Test Adapter (continued)

Test Step	Switch Position	Key	Measurement	Note	Test Specifications (Reading)	Troubleshooting see Coordinates
	V Ω			Connect adapter lead to peripherals and control unit.		
24	11	24	-	Find on/off ratio on idle actuator. (2) Release test pin from ground, set on-off ratio to test specification.	Measurement with dwell angle tester at sockets 1 and 2 (1) Connect test pin to ground (2) Release test pin from ground, set on-off ratio to test specification. (3) Apply throttle. Speed approx. 1600 min ⁻¹ (4) Switch on A/C (when present) (5) Apply throttle, speed above 3000 min ⁻¹ , on-off ratio <u>must</u> become greater.	(1) <u>29.9 %</u> (2) <u>32 %</u> (3) <u>34...39 %</u> (4) <u>39...44 %</u> (5) <u>greater than 36 %</u> E 19
25	12	24	-	Control unit function test (engine at operating temp.) Check injection signal t _i from control unit with oscilloscope. At control unit plug between term. 13 and term. 11	Let engine run at operating temperature.	See <u>upper illustration</u> E 21



Rapid Diagnosis Chart for Universal Test Adapter (continued)

Test Step	Switch Position		Key	Measurement	Note Connect adapter lead to peripherals and control unit.	Test Specifications (Reading)	Trouble-shooting see Coordinates
	V	Ω					
26	12	24	1	As 24, but after pressing key (NTC II-cold) injection time becomes somewhat longer and engine speed increases	Let engine run at operating temperature.		E 23
27	12	24	2	As 24, but after pressing key (NTC II-warm) injection time should remain constant.	Let engine run at operating temperature.	See upper illustration	F 1
28	12	24	6	Control unit function test, full-load enrichment. At control unit plug between term. 13 and term. 11.	Let engine idle at operating temperature. Injection signal must get wider or engine speed must increase as key 6 is pressed.		F 3
29	13	24	-	Hot-wire air-mass sensor. Measurement of voltage of self-cleaning function. At control unit plug between term. 8 and term. 11.	Before this test the engine must run over 2000 min^{-1} and engine temperature must be greater than $+60^{\circ}\text{C}$. Thereafter ignition "OFF" - voltage reading after approx. 4 sec.	2 ... 5 V (Reading duration approx. 1 sec)	F 5



Wide injection signal after key 6 is pressed.

A14

Rapid diagnosis chart
SAAB 900 Turbo USA



A15

Rapid diagnosis chart
SAAB 900 Turbo USA



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.3 ... 2.7 bar

F8

Electric fuel pump

- Fuel delivery (measured in return): min. 900 cm³/30 sec
- Terminal voltage (under load); min. 12 V

J17

Temperature sensor II (engine) (blue)

- Electrical internal resistance at ambient temperature (+15°C...+30°C): 1450 ... 3300 Ω
- engine at operating temp. (approx. +80°C): 280 ... 360 Ω

C12

Solenoid-operated injection valve (at 20°C)

- Electrical internal resistance: 14.5 ... 17.0 Ω

C18

Hot-wire air-mass sensor

- Electrical internal resistance between term. 6 and term. 3: 0 ... 1100 Ω
- between term. 5 and term. 3: 3.6 ... 4.1 Ω

G23**A16**

Test specifications

SAAB 900 Turbo USA



Idle actuator

- Electrical internal resistance at (+15°C....+30°C)
between term. 2 and term. 3: 17 ... 22.5 Ω
between term. 2 and term. 1: 19 ... 25.0 Ω

D7

Idle adjustment

(Engine at operating temperature, approx. +80°C)

H11

Manual and automatic transmission

(low beams on): 775...925 min⁻¹

Basic engine speed (test pin to ground): 725...775 min⁻¹

Lambda closed-loop control

with engine at operating temp.)

H11

Integrator voltage should fluctuate between 0 and 13 V when idle speed is correctly adjusted

G7

Start control with NTC II connector pulled

- Terminal voltage at one solenoid-operated injection valve:

Falls from initial voltage greater than 2.0 V in approx. 15 sec starting time to approx. 0.5 V.

Engine must not turn on. Observe safety precautions!

Exhaust turbo-supercharger

Max. charge-air pressure: 0.7...0.8 bar

Basic charge-air pressure: 0.32...0.38 bar

Pressure-sensing switch

(switching pressure): 0.9...1.0 bar

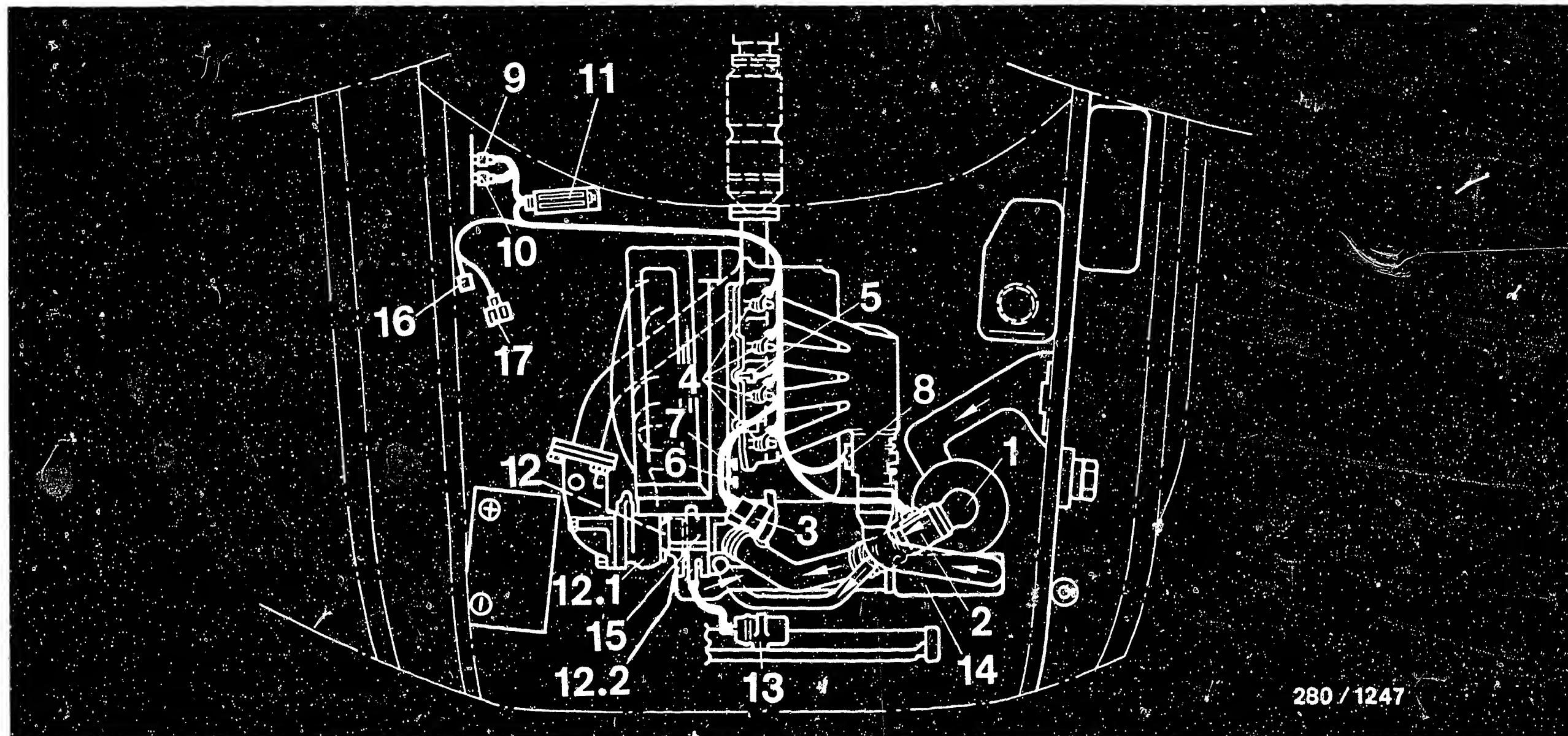
For adjusting values for ignition, valve play, and other technical engine data see equipment and Autodata microcard.

A17

Test specifications

SAAB 900 Turbo USA





280 / 1247

ELECTRICAL WIRING DIAGRAM

- 1 = Air filter
- 2 = Hot-wire air-mass sensor
- 3 = Idle actuator
- 4 = Solenoid-operated injection valves
- 5 = Temperature sensor II (engine)
- 6 = Sensor ground terminal
- 7 = Final stage ground terminal

- 8 = Throttle-valve switch
- 9 = Main relay
- 10 = Pump relay
- 11 = Control unit plug
- 12 = Exhaust turbo-supercharger
- 12.1 = Turbine
- 12.2 = Compressor

- 13 = Ignition coil
- 14 = Charge-air cooler
- 15 = Ignition distributor
- 16 = Test pin
- 17 = 3-pin plug connection (limp-home pin, Lambda integrator voltage, positive connection)

A22

Electrical wiring diagram

SAAB 900 Turbo USA

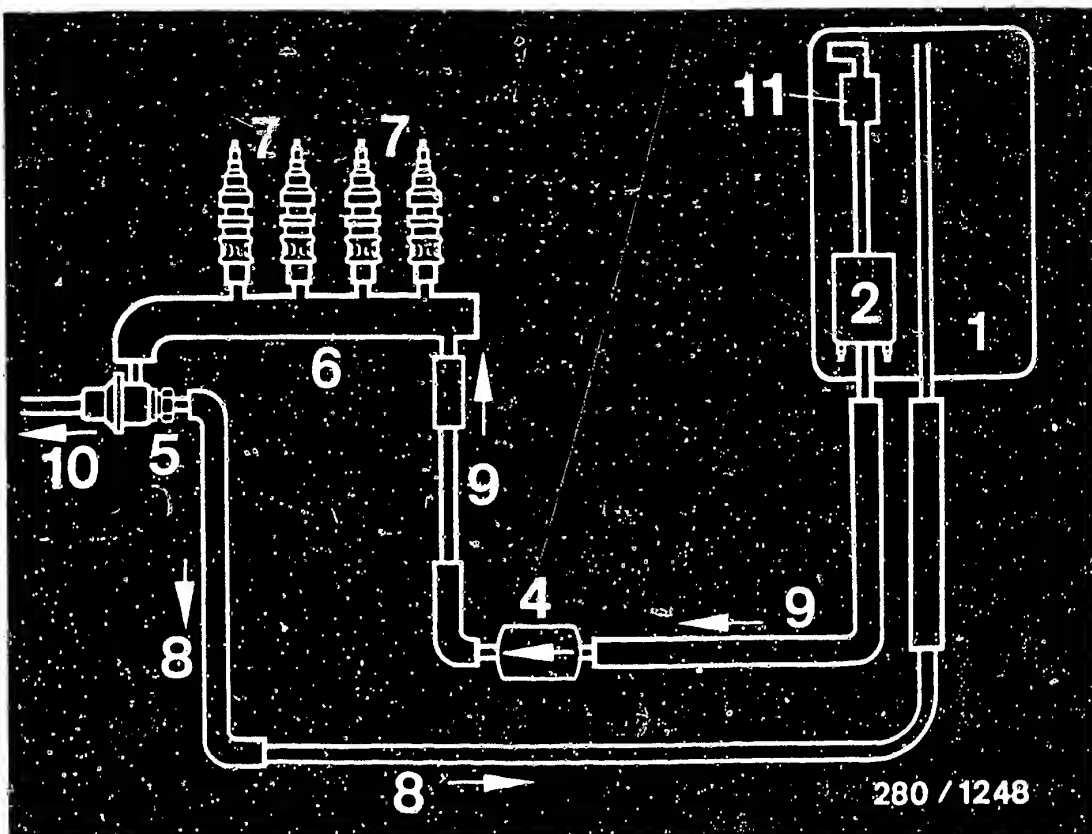


A23

Electrical wiring diagram

SAAB 900 Turbo USA

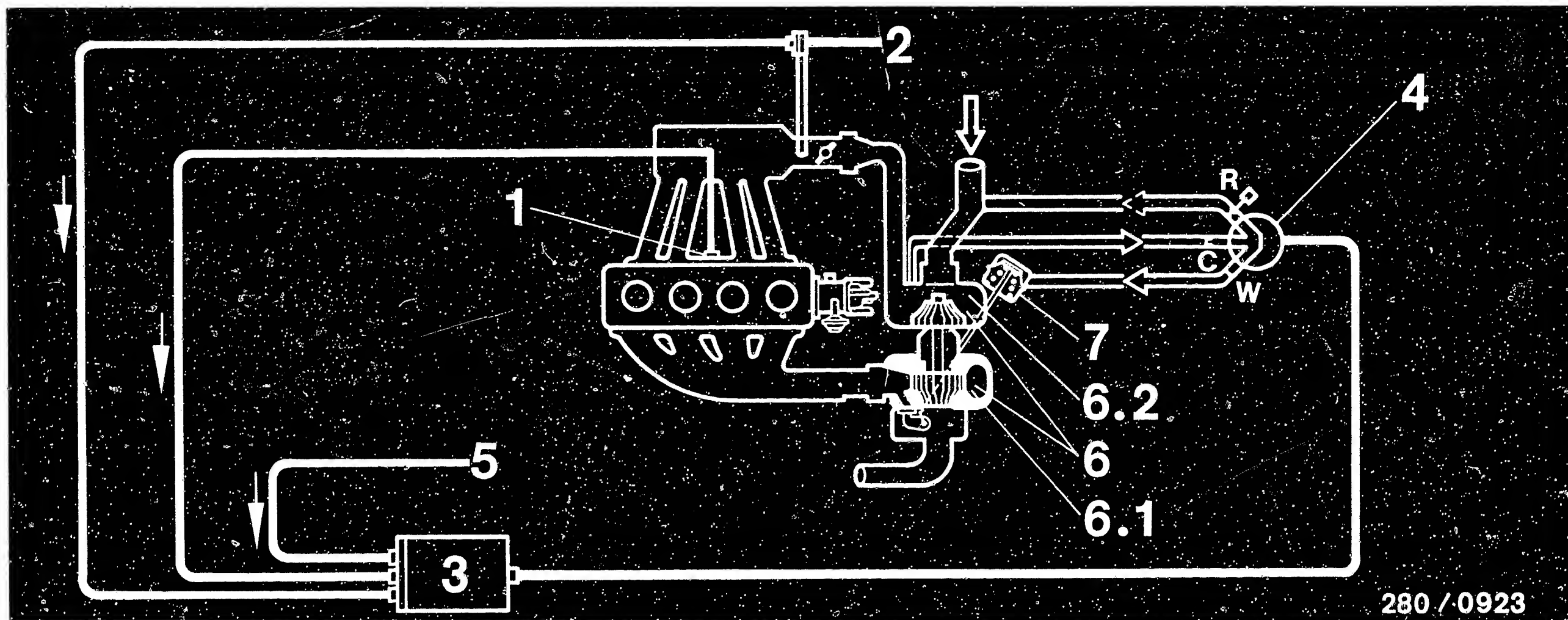




FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = Electric fuel pump (in tank)
- 4 = Fuel filter
- 5 = Pressure regulator
- 6 = Fuel-distribution pipe
- 7 = Solenoid-operated injection valves
- 8 = Fuel return line
- 9 = Fuel pressure line
- 10 = To intake manifold
- 11 = Fuel pre-supply pump (in tank)





KNOCK CONTROL (APC SYSTEM) AND EXHAUST TURBO-SUPERCHARGER DIAGRAM

Function: A knock sensor (1) reacts to the engine's loading condition (knock tendency) and sends an electric signal to a control unit (3), which simultaneously receives electrical signals from a pressure sensor (2) and from the ignition system (engine speed). These electrical signals are processed in the control unit (2) and transmitted as electrical impulses to a solenoid-operated valve (4), which controls charge-air pressure. When this valve (4) is closed, the full pressure from the intake manifold is present at the charge-air pressure valve (7). The charge-air pressure valve (7) then opens and supplies a lower charge-air pressure (depending on basic setting). When the solenoid-operated valve (4) is open, the pressure below the throttle setting is released to the inlet side of the compressor via a hose. The charge-air pressure control valve is then without pressure and closes, thus causing high charge-air pressure.

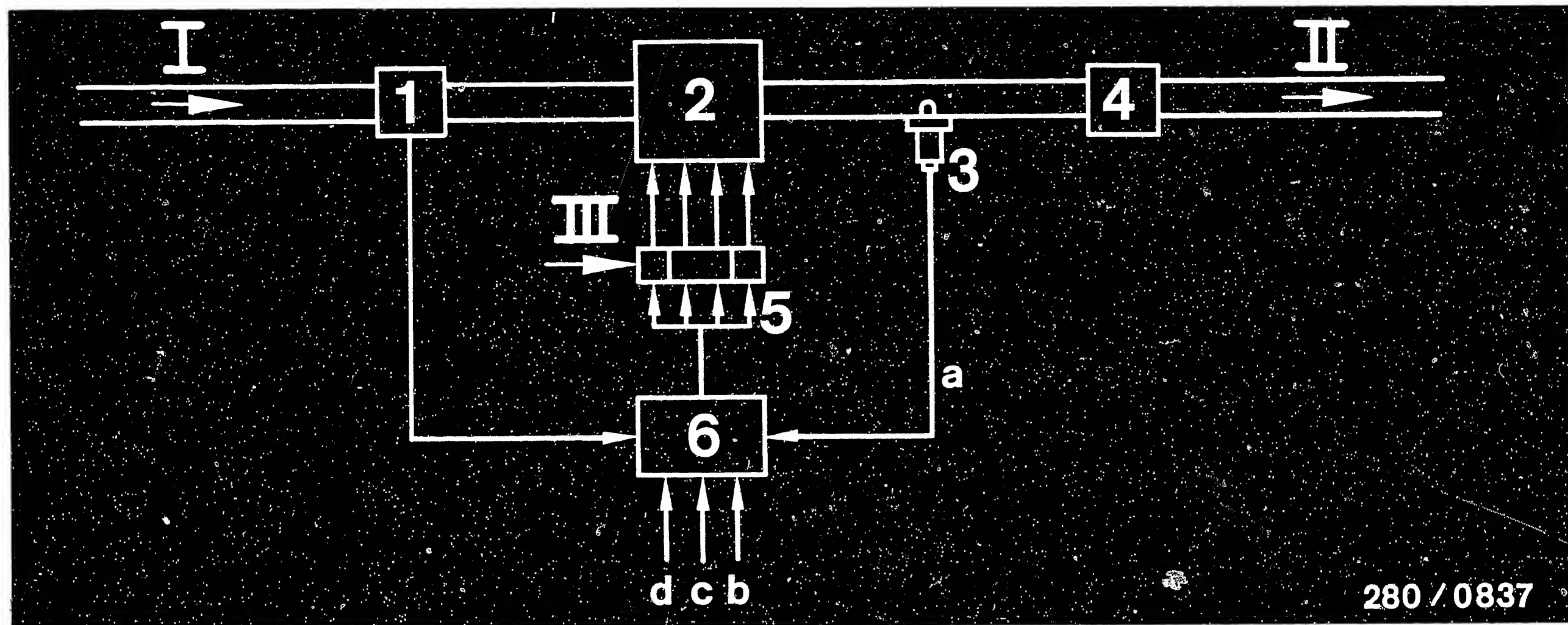
Knock control (APC system)



B2

Knock control (APC system)





280 / 0837

1 = Air-flow sensor
2 = Engine
3 = Lambda sensor
4 = 3-way cat. converter

5 = Solenoid-operated injection valves
6 = LH control unit with lambda closed-loop control

a = Sensor voltage
b = Supply voltage
c = Engine speed
d = Engine temperature

I = Air
II = Exhaust
III = Fuel

OPERATION OF LAMBDA CLOSED-LOOP CONTROL

With a feedback loop closed with the help of a special sensor – the lambda sensor – deviations from a certain air-fuel ratio can be recognized and corrected. The control principle is based on the continuous measurement of the residual oxygen content of exhaust with the lambda sensor. This residual oxygen content provides a measure for the composition of the air-fuel mixture provided to the engine. The lambda sensor in the exhaust pipe supplies data concerning whether the mixture is richer or leaner than $\lambda = 1$. The lambda sensor informs the control unit of this deviation, and the lambda closed-loop control (in the control unit) influences the injection time or quantity pre-calculated by injection control. This closed-loop control to $\lambda = 1$ is required to enable the down-line 3-way catalytic converter to effectively combust toxic substances.

B3

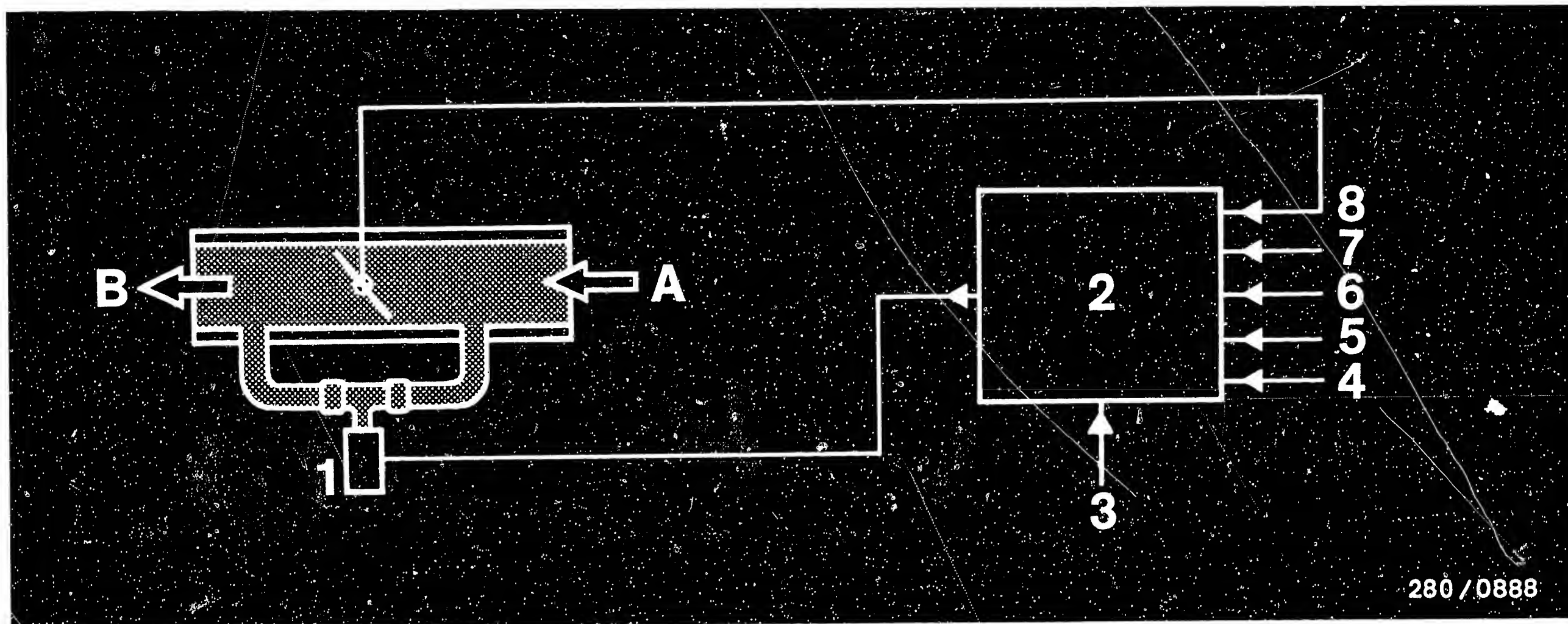
Lambda closed-loop control
SAAB 900 Turbo USA



B4

Lambda closed-loop control
SAAB 900 Turbo USA





1 = Idle actuator
2 = Low-idle-speed control
(LH control unit)
3 = Test pin

4 = Supply voltage
5 = Nominal value switch
6 = Engine temperature

7 = Engine load
8 = Idle contact from
throttle-valve switch

A = From air filter
B = To engine

OPERATION OF IDLE SPEED CONTROL (ISC)

With the help of ISC it is possible to maintain constant idling characteristics for good exhaust and fuel-consumption figures under all conditions. Engine speed drops, for example when switching on air conditioning, automatic steering, or driving position with automatic transmission, are avoided. The circuitry for this system is located in the LH control unit. The idle actuator takes the place of the auxiliary-air device otherwise required.

Advantages

- Constant idle speed under all operating conditions.
- Low consumption from idle-speed reduction.
- No resetting of idle speed required.
- Auxiliary air valves for power steering or a/c are eliminated

- Idle speed increase (switching on a/c) is possible.
- Testing: Electrical and operational testing are carried out with the universal test adapter. ISC testing is included in the testing sequence for the LH-Jetronic. The LH Jetronic and ISC are tested with an adapter lead. The pneumatic testing of the idle actuator is performed as for the auxiliary-air device.

B5

Idle speed control
SAAB 900 Turbo USA



B6

Idle speed control
SAAB 900 Turbo USA



TEST EQUIPMENT AND TOOLS

<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
Universal test adapter Adapter lead Test lead	ETT 018.01	0 684 101 801 1 684 463 141 1 684 463 093
Motortester	e.g. MOT 002.00 MOT 300 MOT 400	0 684 000 200 0 684 000 300 0 684 000 400
Pocket tester	KTE 001.03	0 684 400 103
Exhaust tester Calibrated infra-red exhaust tester	e.g. ETT 008.00 ETT 008.04 or ETT 008.05	0 684 100 800 0 684 100 804 0 684 100 805
<ul style="list-style-type: none"> ● Pressure gauge ● Pressure tester (fuel) Pressure measuring device or Pressure measuring device (can no longer be supplied) ● Connection piece ● Pressure measuring device (air) may be present in diesel work-shop Pressure gauge ● Three-way lead 	Quality grade 1.0 0...6 bar gauge pressure Scale 0.1 bar Quality class 1.0 0...1.6 bar gauge pressure, standard type e.g. Wika Co.	1 687 231 154 KDJE-P 100 KDEP 1034 KDJE-P100/14 No. 4184 KDJE-P100/13

B7

Test equipment and tools

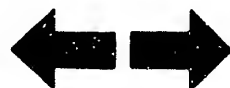
SAAB 900 Turbo USA

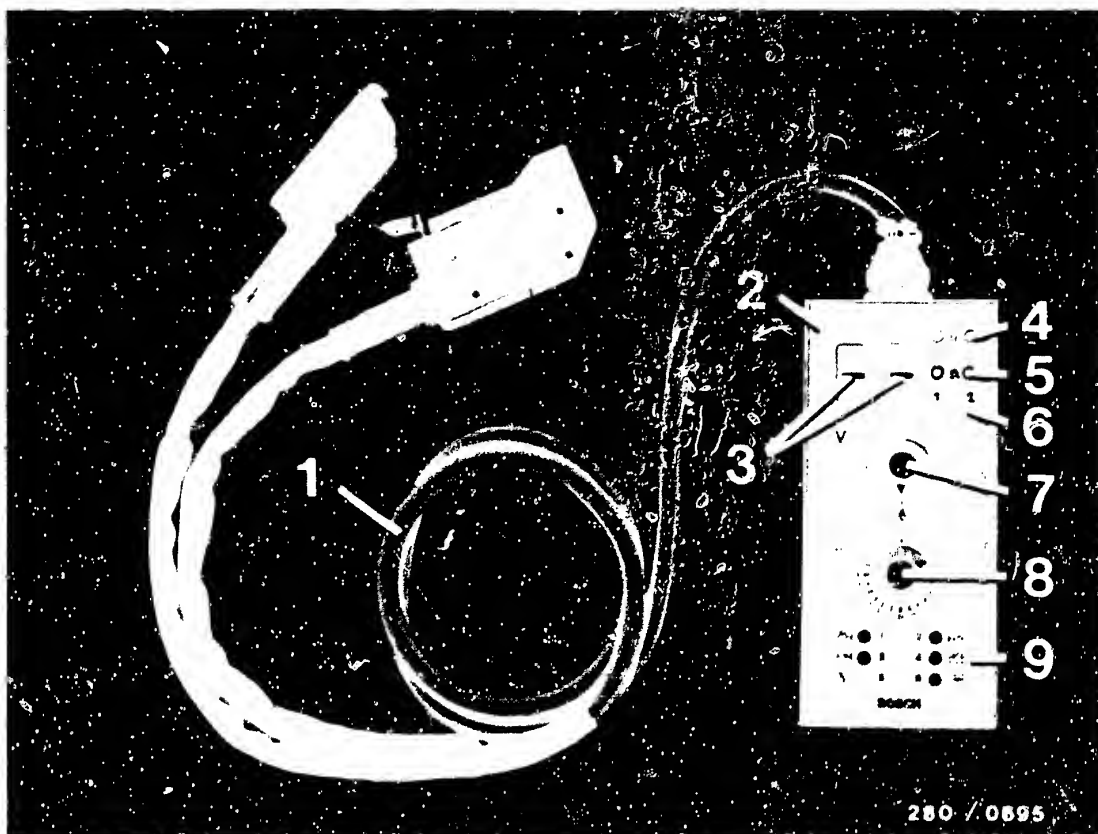


Test Equipment and Tools (continued)

Description	Designation	Part No.
Electrical tester or multimeter	e.g. ETE 014.00 e.g. Philips co. PM 2517 X e.g. Mixelco co. Master 50 K e.g. Fluke co.	0 684 101 400
• Solenoid- operated injection valve		0 280 150 706
• Parts set for solenoid-operated injection valves		1 287 010 704
Silicon assembly grease for solenoid- operated injection valves	Ft 2 v 1	5 700 080 125
Lambda sensor assembly paste	VS 140 16 Ft	5 964 080 105

For removing and pressing on the idle-CO anti-tamper device of the air-mass sensor, use suitable commercially available tools.





● Universal Test Adapter with Adapter Lead for LH-Jetronic

- 1 = Adapter lead (part no.: 1 684 463 141)
- 2 = Universal test adapter (part no. 0 684 101 801)
- 3 = Test wells (for motortester)
- 4 = Test jacks (for voltage measurement)
- 5 = Test jacks (for resistance measurement)
- 6 = Test jacks (for dwell-angle tester)
- 7 = Program switch "V"
- 8 = Program switch "Ω"
- 9 = Key field

Keys 1 and 2: Temperature sensor, cold and warm

Keys 3 and 4: Nonlocking switch for ground or voltage supply

Keys 5 and 6: Idle/full-load simulation



Connection:

The figure to the right shows both measuring setups in connection with the universal test adapter. From top to bottom:

- Measuring setup with a motortester (1).
- Measuring setup with universal test adapter (8) with LH adapter lead (13).
- Measuring setup with a multimeter (14) or a dwell-angle tester (15)

The dashed lines show optional measuring setup possibilities.

- Connecting universal test adapter (8)
- Connect LH adapter lead (13) to universal test adapter.
- Pull out Jetronic wiring-harness control unit plug (9) from control unit and connect to adapter lead wiring-harness plug (19).
- Plug adapter lead control unit plug (11) to control unit (12). (Please observe instructions for the individual test steps)

Measuring setup for testing with a motortester (1):

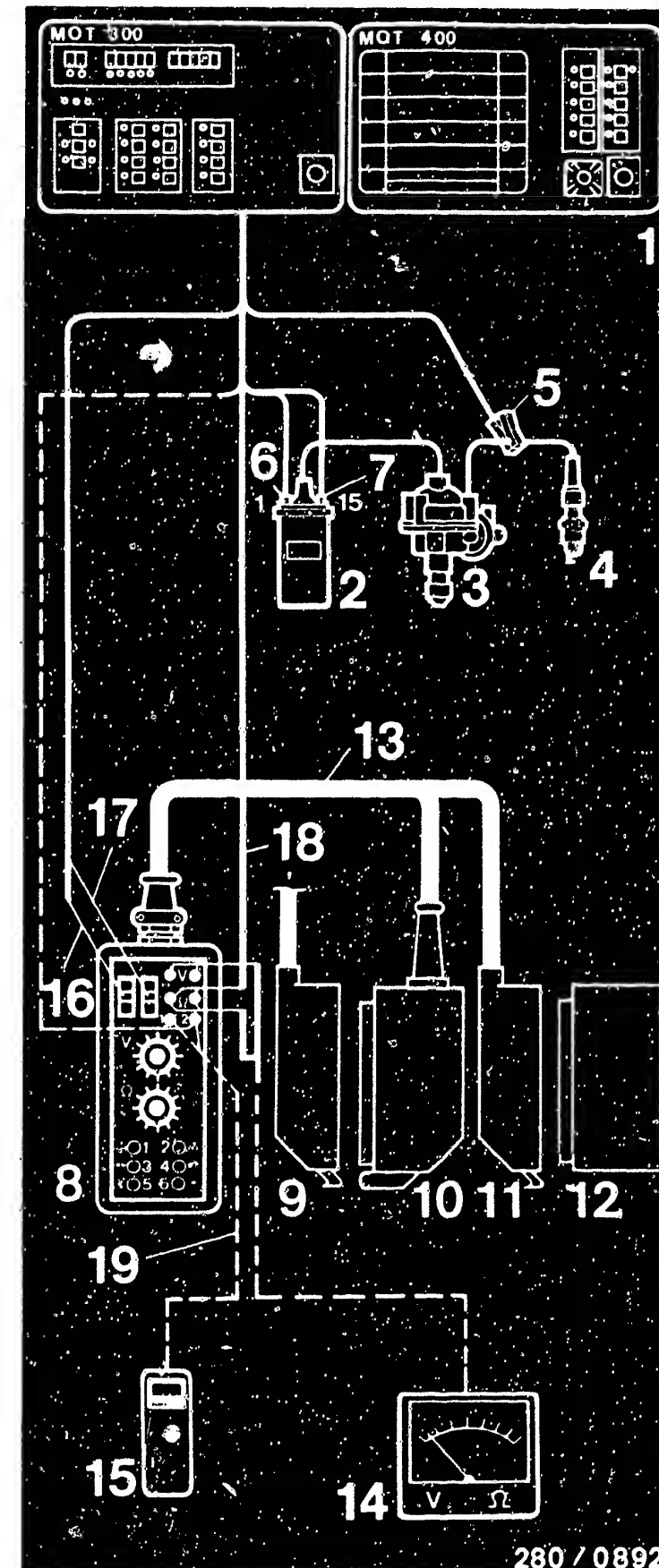
- Clamp-on induction pickup (5) to ignition lead of 1st cylinder (4) (near distributor) (3).
- Red terminal (16) to red terminal post.
- Black terminal (17) to black terminal post.
- Resistance test lead (18) with red and black test prods to the blue jacks.
- Connect green (6) and yellow (7) clips to jacks 1 and 2 on universal test adapter (8) for dwell-angle measurement.

Measuring setup for testing with a multimeter (14) R_i min, 20 k Ω /V

- Measuring resistance
Set multimeter (14) to position Ω or plug test leads into connections for measuring resistance and plug test leads into blue test jacks on universal test adapter.
- Measuring voltage
Set multimeter (14) to V position or plug test lead into connections for voltage measurement and plug test leads on universal test adapter into the red and black test jacks (observe polarity).
- Dwell-angle measurement
Set pocket tester (15) to 100 % dwell-angle position. Connect connector lead (19) to jacks 1 (-) and 2 (+) on universal test adapter.

Careful!

Plug and unplug universal test adapter only while ignition is off.



B 10

Test equipment and tools
SAAB 900 Turbo USA

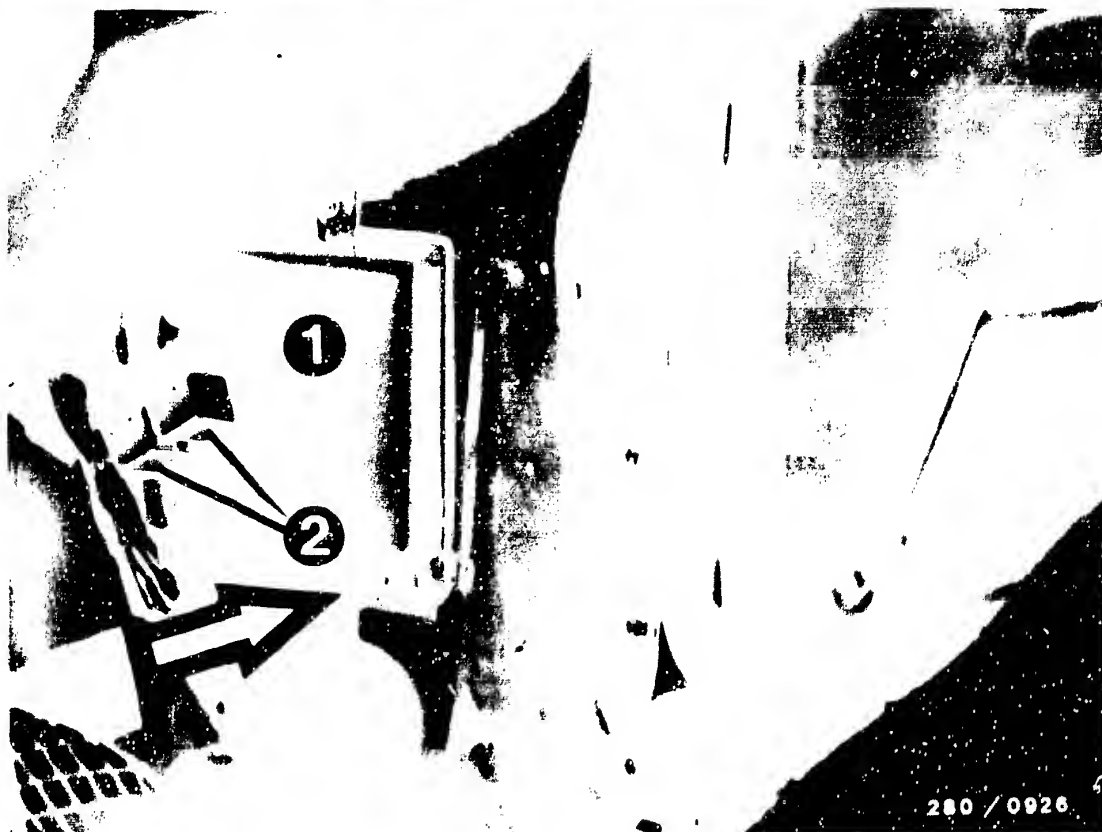


B 11

Test equipment and tools
SAAB 900 Turbo USA



280 / 0892



1 = Control unit

2 = Main and pump relays

To connect the universal test adapter, unplug control unit plug (25 pin). To do this, press detent in direction of arrow.

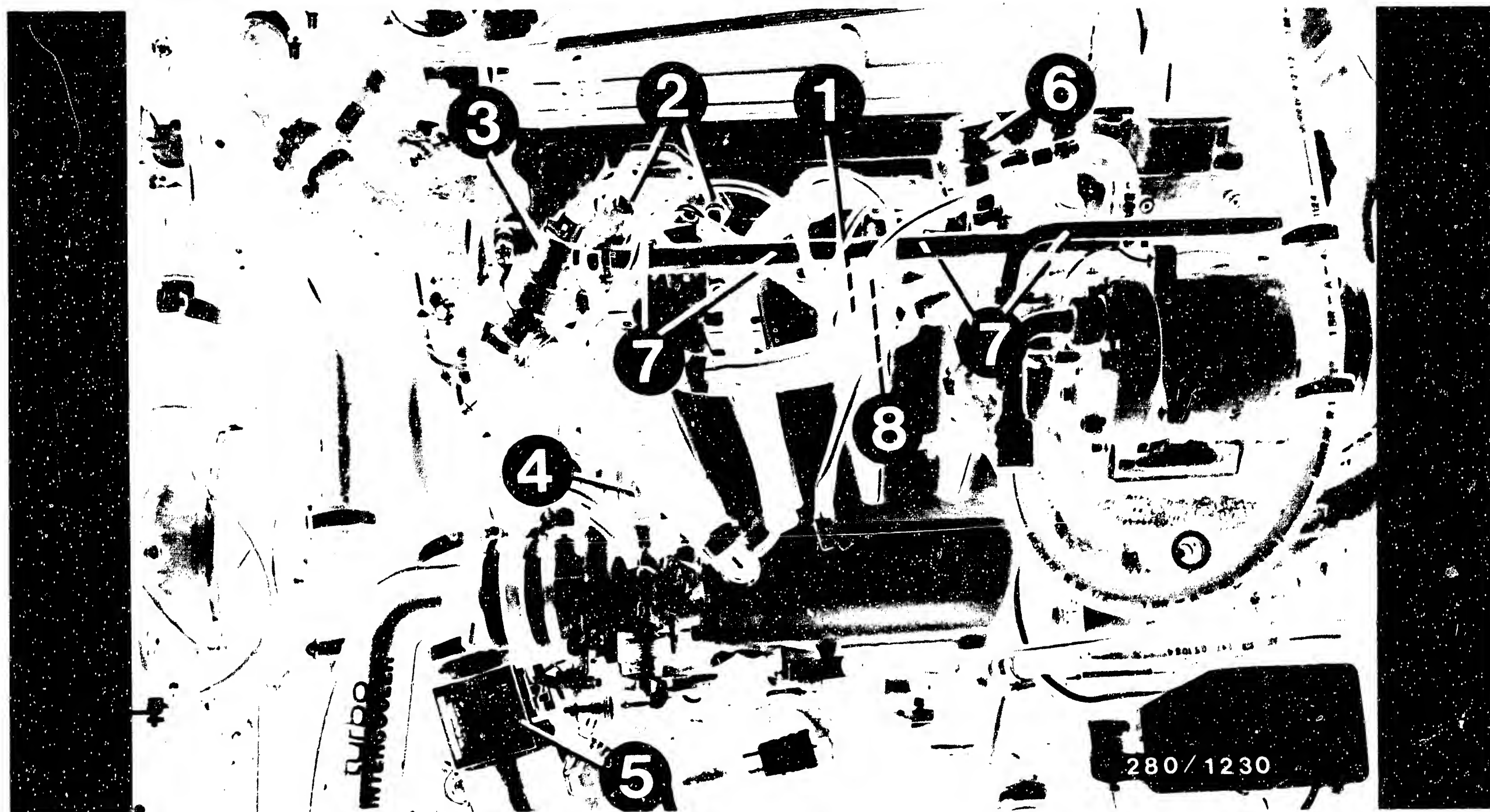
INSTALLATION POSITION OF COMPONENTS

Installation position instructions are always given relative to direction of travel.

Control unit:

The control unit is located in the passenger's side footwell on the right underneath the carpet.





Installation Position of Components (continued)

- 1 = Temperature sensor II (engine),
blue plug
- 2 = Ground terminals

- 3 = Idle actuator
- 4 = Throttle-valve switch
- 5 = Hot-wire air-mass sensor

- 6 = Pressure regulator
- 7 = Solenoid-operated injection valves
- 8 = Knock sensor

B 13

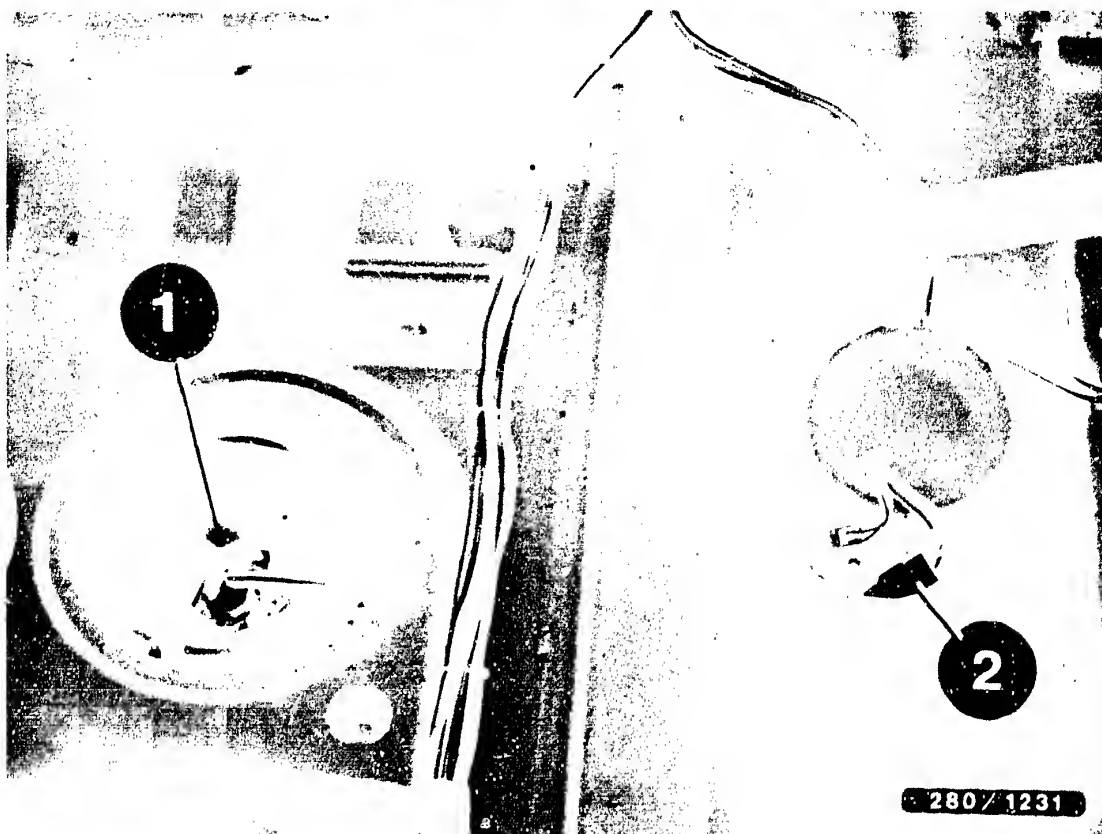
Installation position of components
SAAB 900 Turbo USA



B 14

Installation position of components
SAAB 900 Turbo USA





Installation Position of Components (continued)

1 = Electric fuel pump

2 = Tank sensor

- The pressure-sensing switch is located underneath the instrument panel.
- Control unit knock control: underneath rear seat
- Solenoid-operated valve: near ignition coil.
- Charge-air pressure control valve: on turbo-supercharger.
- Pressure sensor: near fuel filter.



IMPORTANT GENERAL INFORMATION

- Never start engine without securely connected battery.
- Never use a starting aid with more than 16 V!
- Never disconnect battery with engine running.
- Disconnect battery from vehicle electrical system when fast charging.
- Remove control unit at temperatures above +80°C (paint drying installation).
- Ensure that all wiring harness plug connectors are properly seated.
- Never connect or disconnect control unit plug with ignition switch on.
- When testing compression, disconnect power supply by removing control relay. Undesired injection is thus prevented.
- Remove the Jetronic control unit before doing electric welding work (e.g. spot welding).
- When installing an alarm system, proceed per SIS microcard ALL-500.
- In the following trouble-shooting program, it is assumed that engine, ignition, and electrical system are in proper working order.
- In order to carry out testing work and evaluate the components, it is necessary to be familiar with the L-Jetronic and its operation. The operation and construction of the L-Jetronic are described in Technical Instruction VDT-U3/3 and the Technical Bulletins, New Product. VDT-I-280/



TROUBLE-SHOOTING DIAGRAMS

The following trouble-shooting diagrams are intended to enable workshop employees to quickly locate causes of trouble on the LH-Jetronic, using the universal test adapter with adapter lead (1 684 463 141) and other suitable test equipment. Depending on the level of the mechanic's knowledge and experience, one of the following two procedures can be followed:

- Detailed step-by-step trouble-shooting

For employees with little experience or practice on LH-Jetronic. A complete trouble-shooting program is carried out after a customer complaint.

C3

- Pin-pointed direct trouble-shooting

For trained, experienced employees with much practice on vehicles with LH-Jetronic. After a customer complaint, a certain component within the trouble-shooting program is tested.

C5

Both trouble-shooting programs begin with an inspection of the electrical part of the LH-Jetronic with the aid of the universal test adapter with adapter lead. In this way, the wiring harness with the connected components is soon checked for proper electrical operation, and any faults are quickly located.

If no fault is found using the universal test adapter with adapter lead, carry out a fuel pressure check.

If no fault is found here, continue trouble-shooting with the detailed or the direct trouble-shooting program.

C1

Trouble-shooting chart
SAAB 900 Turbo USA



C2

Trouble-shooting chart
SAAB 900 Turbo USA



Detailed Step-by-Step Trouble-Shooting for Complete Trouble-Shooting Program

- Electrical testing with universal test adapter and adapter lead 1 684 463 141 and motortester or multimeter

This test must come at the beginning of the test program and must be performed from beginning to end (Coordinates C9 ... F7)

- Fuel pressure test with pressure gauge
This test must directly follow testing with the universal test adapter, and must be performed from beginning to end (coordinates F8...G4)
- Trouble-shooting according to customer complaints (symptoms of trouble)
The table below contains possible symptoms of trouble and gives the first coordinate of the applicable detailed trouble-shooting program in the column on the right. This program consists of logically-sequenced testing procedures for all individual components of the LH-Jetronic. If, after completing the trouble-shooting program for an assumed symptom, the fault has not been detected and remedied, a new symptom must be determined and the corresponding program worked through.

<u>Customer complaint (symptoms of trouble)</u>	<u>Electrical testing with universal test adapter</u>	<u>Fuel pressure testing with pressure gauge</u>	<u>Trouble-shooting program</u>
1. Starting motor cranks, engine fails to start or starts poorly	C 9	F 8	G 5
2. Engine starts but then dies	C 9	F 8	G 15
3. Uneven idle or incorrect idle speed	C 9	F 8	H 3
4. Poor throttle take-up	C 9	F 8	J 1
5. Engine misses under all operating conditions	C 9	F 8	J 15
6. Excessive fuel consumption	C 9	F 8	K 11
7. Insufficient maximum power or maximum speed	C 9	F 8	L 1
8. Idle speed and CO content too high or too low	C 9	F 8	M 1

C3

Trouble-shooting
SAAB 900 Turbo USA

**C4**

Trouble-shooting
SAAB 900 Turbo USA



Pin-Pointed Direct Trouble-Shooting for Components within the Trouble-Shooting Programs

- Electrical testing with universal test adapter, adapter lead (1684 463 141), and motortester or multimeter
Testing with the universal test adapter must come at the beginning of the test program and must be performed from beginning to end (coordinates C 9 ... F 7).
- Fuel-pressure testing with pressure gauge
Fuel-pressure testing must be carried out subsequent to testing with the universal test adapter, and must be performed from beginning to end (coordinates F 8 ... G 4).
- Trouble-shooting per customer complaint
The table below contains various symptoms of trouble, each with several possible causes of trouble. The reference field gives the first coordinate of the test procedure for the individual LH-Jetronic components involved. If after testing the individual components the trouble has not been detected or remedied, a new trouble symptoms must be chosen.

Customer complaints (symptoms of trouble)

- | 1. Starting motor cranks, engine fails to start or starts poorly
- | | 2. Engine starts but then dies
- | | | 3. Uneven idle or incorrect idle speed
- | | | | 4. Poor throttle take-up
- | | | | 5. Engine misses under all driving conditions
- | | | | 6. Excessive fuel consumption
- | | | | 7. Insufficient maximum power or maximum speed
- | | | | 8. Idle speed and CO content too low or too high

Cause (component faults)

C 9	C 9	C 9	C 9	C 9	C 9	C 9	C 9	Electrical faults. Test with universal test adapter.
F 8	F 8	F 8	F 8	F 8	F 8	F 8	F 8	Faults in fuel supply: (Check main and pump relay, pump fuse, in-tank electric fuel pump, fuel pressure and pressure regulator. Fuel pressure does not remain constant), leakage in non-return valve.
G11	G17	H13	J 5					Idle actuator fails to open
						M 3		Idle actuator fails to close
	G23		J 9	K 5	K21	L13	M13	Hot-wire air-mass sensor
			J21					Coughing in overrun operation
G11								Hot starting

Customer complaints (symptoms of trouble)

1. Engine fails to start or starts poorly
2. Engine starts but then dies
3. Uneven idle or incorrect idle speed
4. For throttle take-up
5. Engine misses under all operating conditions
6. Excessive fuel consumption
7. Insufficient maximum power or maximum speed
8. Idle speed and CO content too high or too low

Cause (component fault)

G 7						M 5	Defective start control	
G13	H 1	H19	J11	K 7		L15	M15	Leakage in induction system
		H15		J23	K15			Defective solenoid-operated injection valves, connect test lead, repair
	G19				K13		M 9	Leakage in solenoid-operated injection valves
				J17		L 7		Insufficient fuel delivery from electric fuel pump
						L 9		Exhaust turbo-supercharger or knock control (APC system) defective
		H 7	J 5	J21				Throttle valve not closing, throttle-valve switch (adjustment)
						L 3		Throttle valve not opening fully
		H 9	J 7					Throttle-valve damper setting
G13	H 1	H19	J11	K 7		L15		Open circuit in wiring harness and plug connections
		H21	J13	K 9	K23		M17	CO exhaust-setting too rich, idle adjustment
		H21	J13	K 9			M17	CO exhaust-gas setting too lean, idle adjustment
				J19				Interference, misses, ground contact
				J19		L 5		Control unit defective

C7

trouble-shooting

SAAB 900 Turbo USA



C8

trouble-shooting

SAAB 900 Turbo USA



TEST CHART FOR THE UNIVERSAL TEST ADAPTER

with connected adapter line 1 684 463 141 for LH-Jetronic in the Saab 900 Turbo US version (8.84->)

From 8.84 to 7.85, control unit no. 0 280 000 515

From 8.85, control unit no. 0 280 000 537

- Prior to testing with the universal test adapter, check all multiple plug connections for loose connections. Clean any dirty or corroded pin contacts.
- Look for pin receptacles that have been pushed back. If necessary, bend back locking lugs and push receptacle into plug housing up to stop, locking lug engages.
- Strong possibility of line breaks at points of kinking and squeezing.

Control unit installation position: Passenger side footwell to the right below on A-beam. With the universal test adapter, the peripherals of the electrics are checked, and the LH control unit as well via a function test. Remove Jetronic wiring harness control unit plug from control unit and connect with adapter lead plug. Connect the free end of the adapter lead to the control unit (ignition must be off). In order to obtain measurement values, connect a motortester to the universal test adapter, as well as a multimeter for voltage and resistance measurements. Careful! Since the adapter lead must always be connected for peripheral and functioning testing, the → instructions in the test chart must be observed.

The individual test steps are selected via two program switches (one for voltage measurements, the other for resistance measurements). Each program switch has 24 test positions, however, for the LH version these are only partly occupied. If a defect is located during a test, testing must be repeated after rectifying the defect. Testing with the universal test adapter must always be carried out completely.

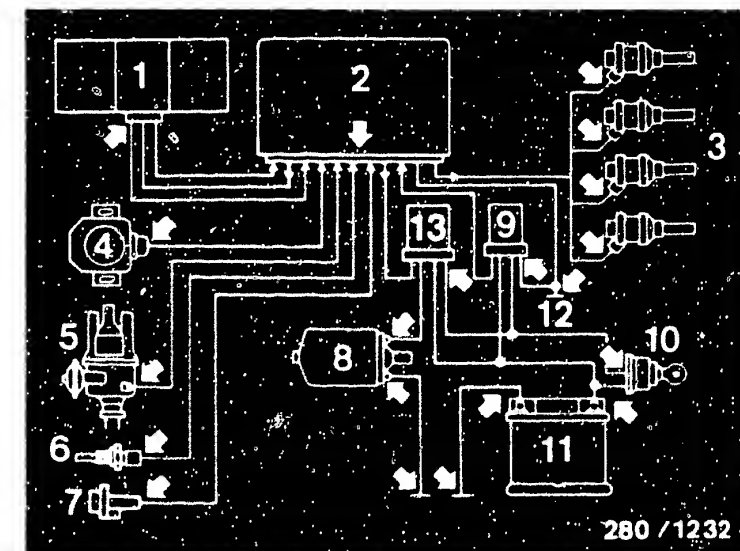
Always observe the instructions given in the test chart!

o In test steps 1 ... 11 resistance is measured. Set motortester and multimeter to "resistance measuring range."

o In test steps 12 ... 16 voltage is measured during starting and while ignition is "ON".

Set motortester and multimeter to "voltage measuring range."

- In test steps 17 ... 29 tests are carried out while engine is running. Test specifications and operating instructions for the universal test adapter are given in the following test list.



Electrical plug connections (arrows)

- 1 = Hot-wire air-mass sensor
- 2 = Control unit
- 3 = Injection valves
- 4 = Throttle-valve switch
- 5 = Ignition distributor
- 6 = Temperature sensor (engine)
- 7 = Idle actuator
- 8 = Electric fuel pump
- 9 = Main relay
- 10 = Ignition lock
- 11 = Battery
- 12 = Central ground
- 13 = Pump relay

C9

Test chart for universal test adapter
SAAB 900 Turbo USA



C10

Test chart for universal test adapter
SAAB 900 Turbo USA



Prerequisites for Correct Testing Procedure

1. Begin testing at test step 1
2. Sequence of test steps must be adhered to. The trouble-shooting information provided is based on the preceding test-step trouble-shooting.

Example:

When in test step 1 the ground connection term. 11 for the control unit is tested, this testing is not repeated again in further test steps.

3. If an incorrect value is displayed in a test step, after removing the defect this test step must be repeated.

Caution!


Test steps 1 to 16: connect adapter lead only to peripherals.

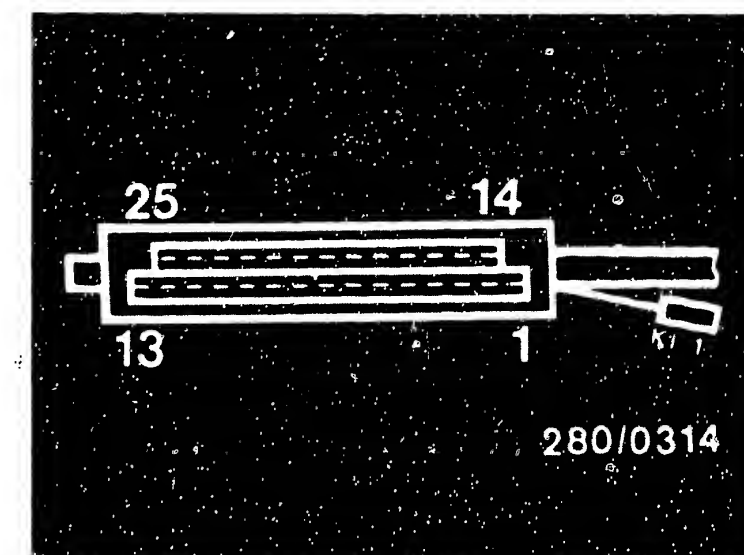
Test steps 17 to 29: connect adapter lead to control unit and peripherals!

Note:

In the following test steps a white surround in the "Operation" column indicates which operation is different from the preceding test step.



TEST STEP 1 (Connect adapter lead only to peripherals)					
<u>Operation:</u>		<u>Reading:</u>		<u>Peripherals test</u>	
<u>Program switch</u> "V" to position			<div>Measuring equipment must show, at ambient temperature (+15°C...+30°C): 1450 ... 3300 Ω</div> <div>with engine at operating temperature (+80°C): 280 ... 360 Ω</div> <div><div>V</div><div>yes</div>Continue test- ing with <u>next</u> test step.<div>V</div></div>		
<u>Program switch</u> "Ω" to position					5
<u>Measuring equipment:</u> Motortester/multimeter		<div>Operation: Resistance value from control unit plug term. 2 to ground terminal for sensors</div> <div>Malfunction: Resistance outside of tolerance</div>			
<u>Measuring range:</u> x 1 Ω					
<u>Connection:</u>					
Blue test jacks					
<u>Operation in vehicle:</u> ---					



Top view of control unit plug

- 1 = Temperature sensor II (engine)
blue plug
2 = Sensors ground terminal



Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Measure resistance value directly on temperature sensor (blue plug).
At ambient temperature (+15°C...+30°C): 1450 ... 3300 Ω
With engine at operating temperature (approx. +80°C): 280 ... 360 Ω

Check following leads for continuity with ohmmeter (set value approx. 0 Ω):

- From control unit plug term. 2 to temperature sensor II (engine) term. 2.
 - Lead 38 from temperature sensor II to sensors ground terminal.
 - From control unit plug term. 11 to sensors ground terminal.
- Eliminate contact resistances in plug connections. Spring contacts must not be able to be pushed back! If the measured resistance lies outside of tolerance → replace temperature sensor. (Tightening torque 20 Nm).

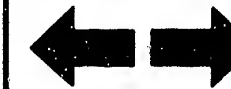
C12

Test chart for universal test adapter
SAAB 900 Turbo USA

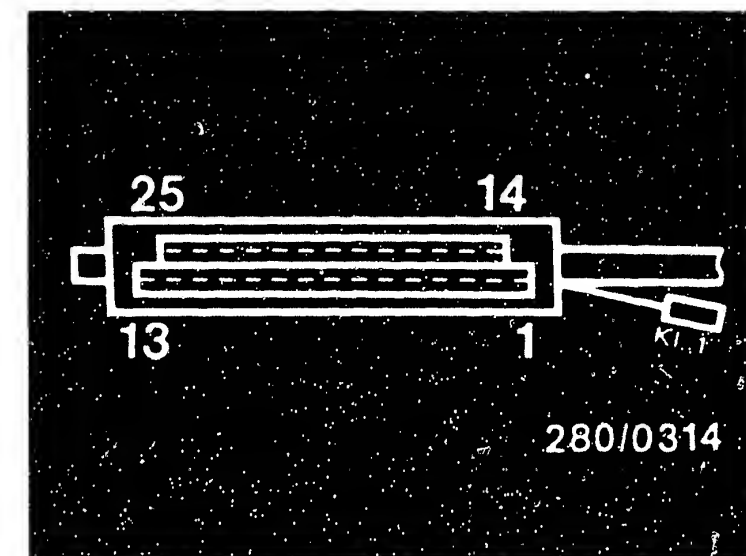


C13

Test chart for universal test adapter
SAAB 900 Turbo USA

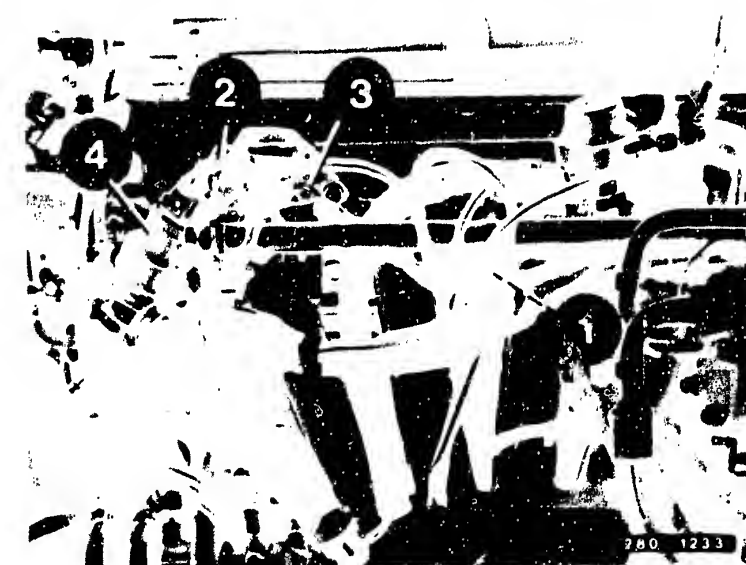


TEST STEP 2 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position	↓	Measuring equipment must show 0 ... 10 Ω	Component:
Program switch " Ω " to position	6		Output stage ground connection
Measuring equipment: Motortester/multimeter		yes	Operation:
Measuring range x 1 Ω		V	Resistance from control unit plug term. 25 to output stage ground terminal
Connection:		Continue testing with next test step.	Malfunction:
Blue test jacks			Resistance outside of tolerance
Operation in vehicle:			



Top view of control unit plug

3 = Output stage ground terminal



Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram..

Check following leads for continuity using ohmmeter (set value: approx. 0 Ω):

- From control unit plug term. 25 to output stage ground terminal.

Loosen ground screw. Clean connection. Subsequently firmly retighten screw. Eliminate contact resistances at plug connection.

C14

Test chart for universal test adapter
SAAB 900 Turbo USA



C15

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 3 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Programs which "V" to position:	↓	Measuring equipment must show 0 ... 10 Ω	Component:
Program switch "Ω" to position:	7		Ground connection of sensors ground terminal
Measuring equipment: Motortester/multimeter			Operation:
Measuring range: x 1 Ω			Resistance value of control unit plug term. 5 to ground terminal
Connection:			Malfunction:
Blue test jacks			Resistance outside of tolerance
Operation in vehicle:		<div> <div>V</div> <div>yes</div> <div>Continue test- ing with next test step</div> </div>	no
---			V

Trouble-shooting:

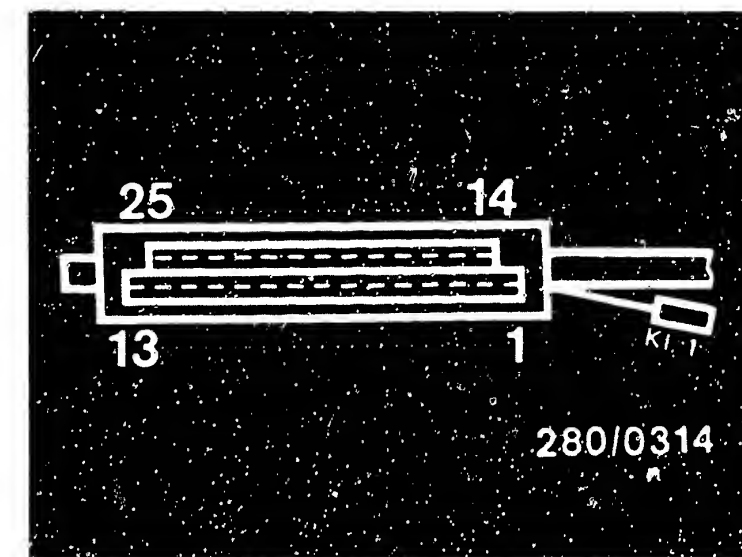
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Check following leads for continuity with ohmmeter (set value approx. 0 Ω):

Ω From control unit plug term. 5 to sensors ground terminal.

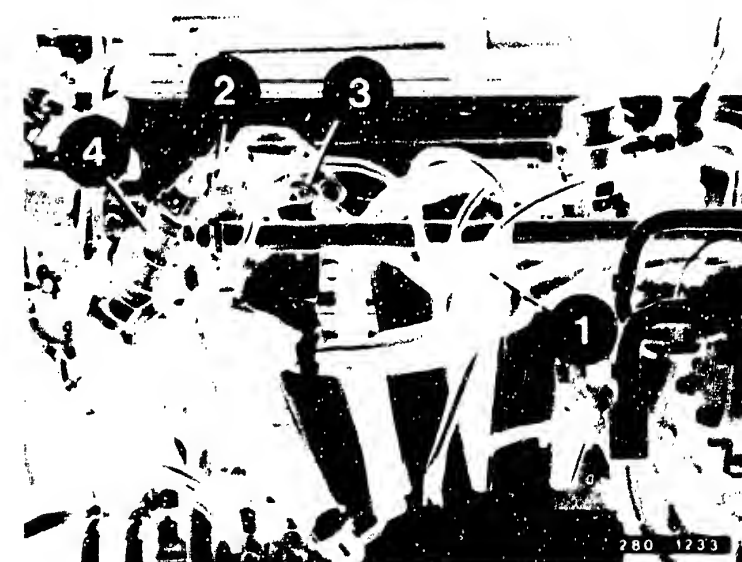
Loosen ground screw. Clean connection. Subsequently firmly retighten screw.

Eliminate contact resistances in plug connections.



Top view of control unit plug

2 = Sensors ground terminal



C16

Test chart for universal test adapter
SAAB 900 Turbo USA



C17

Test chart for universal test adapter
SAAB 900 Turbo USA



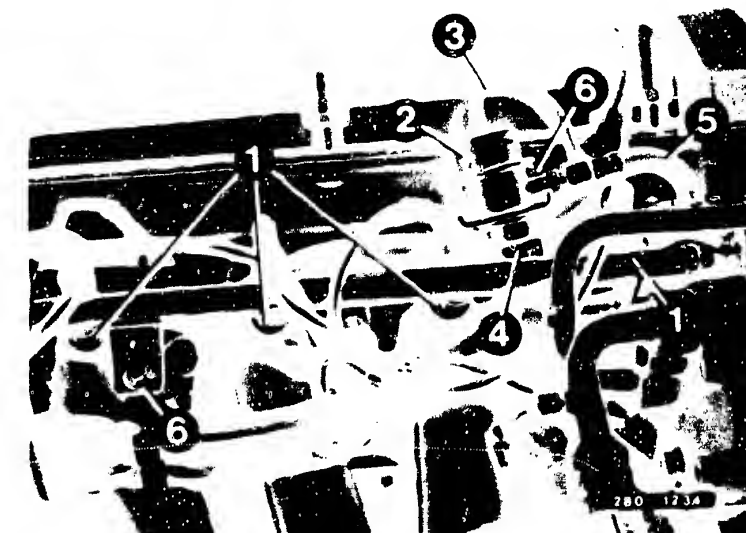
TEST STEP 4 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	↓	Measuring equipment must show, at ambient temperature (+15°C...+30°C) 6.80 ... 9.30 Ω;	Component: Solenoid-operated injection valves 1, 2, 3 and 4
Program switch "Ω" to position:	8		
Measuring equipment: Motortester/multimeter		with engine at opera- ting temperature (80°C): 7.00 ... 9.80 Ω.	Operation: Resistance value at control unit plug term. 13 to sensors ground terminal.
Measuring range: x 1 Ω		Bridge inserted.	
Connection: Blue test jack			Malfunction: Resistance outside of tolerance
Operation in vehicle: Remove plug from sensor heat- ing and insert bridge in con- nection plug. <u>Careful!</u> After testing, remove bridge and plug in plug.		V yes Continue test- ing with <u>next</u> test step.	
			V

Trouble-shooting:

For testing remove control unit plug from test adapter, and if necessary use circuit diagram.

Check following leads for continuity with ohmmeter (set value approx. 0 Ω):

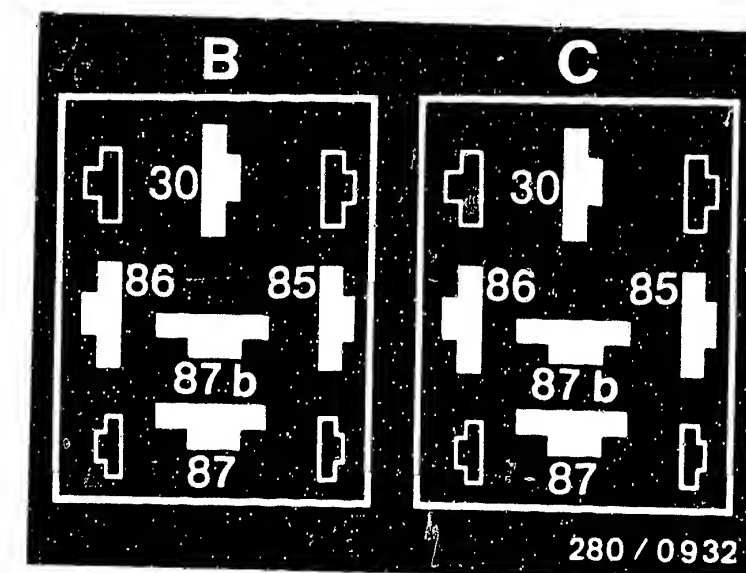
- From control unit plug term. 13 to solenoid-operated injection valves.
- From solenoid-operated injection valves to pump relay term. 87
- From pump relay term. 87 to sensor heating.
Remove plug from sensor heating and with the plug insert a short-circuit bridge (in direction of control unit).
- Check ground connection of sensor heating.



1 = Solenoid-operated injection valves

Main relay (B) and pump relay (C) removed.

Top view of plug base



C18

Test chart for universal test adapter
SAAB 900 Turbo USA



C19

Test chart for universal test adapter
SAAB 900 Turbo USA



Test step 4 (continued)

Careful! After testing, the bridge must be removed and the connector plugged in.

Resistance measurement at injection valve:

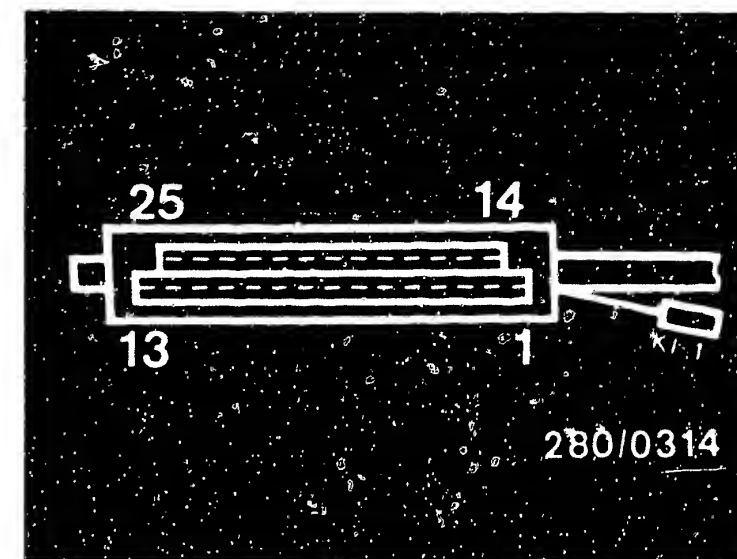
At ambient temperature (+15°C...13°C):

14.5 ... 17.0 Ω

With engine at operating temperature:

16.5 ... 19.5 Ω

Pump relay: In passenger compartment, passenger's sign footwell, to the right
below next to LH control unit.



Top view of control unit plug

2 = Sensor heating plug connection



C20

Test chart for universal test adapter
SAAB 900 Turbo USA



C21

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 5 (Connect adapter lead only to peripherals)			
Operation:		Reading:	
Program switch "V" to position:		Measuring equipment must show	
		0 ... 10 Ω 1)	
Program switch "Ω" to position:		$\infty\Omega$ 2)	
		$\infty\Omega$ 3)	
Measuring equipment: Motortester/multimeter		after 3 ... 6 s, measuring equipment must show	
Measuring range: x 1 Ω		0 ... 10 Ω	
Connection: Blue test jacks		V yes	no
Operation in vehicle:		V	
Accel. pedal not operated 1)		Continue with	
Depress accel. pedal halfway 2)		next test	
Release accel. pedal 3)		step	
		V	

Peripherals testing

Component:

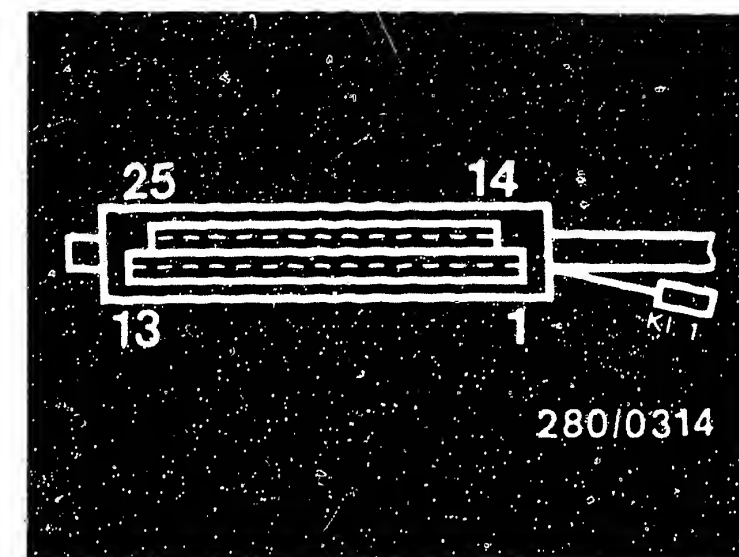
Throttle-valve switch (idle contact) and mechanical throttle-valve damper

Operation:

Resistance value at control unit plug term. 3 to output stage ground terminal

Malfunction:

Resistance outside tolerance



280/0314

Top view of control unit plug

1 = Throttle-valve switch

Trouble-shooting:

For testing remove control unit plug from test adapter, and if necessary use circuit diagram.

Adjusting throttle-valve switch: Loosen throttle-valve switch fastening bolt somewhat.

Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch a bit to the left, then to the right, until idle contact closes (microswitch clicks audibly). Reading approx. 0 Ω . Retighten fastening bolt. If reading is incorrect, replace throttle-valve switch.

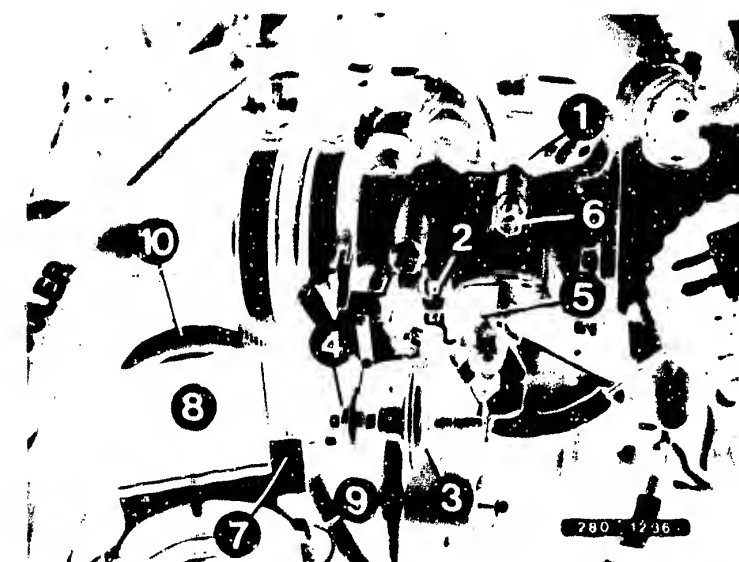
Adjustment check: Pull accelerator cable slightly. Idle contact opens (microswitch clicks audibly). Reading $\infty\Omega$.

Check following leads for continuity with ohmmeter

(Set value approx. 0 Ω):

- From control unit plug term. 3 to throttle-valve switch term. 2.
- From throttle-valve switch term. 18 (lead 48) to ground terminal output stage.
- Spring contacts must not be able to be pushed back.
- Eliminate contact resistances at plug connections.

See D1/D2 for continuation



C22

Test chart for universal test adapter

SAAB 900 Turbo USA



C23

Test chart for universal test adapter

SAAB 900 Turbo USA



Test Step 5 (continued)

Mechanical throttle-valve damper

Testing:

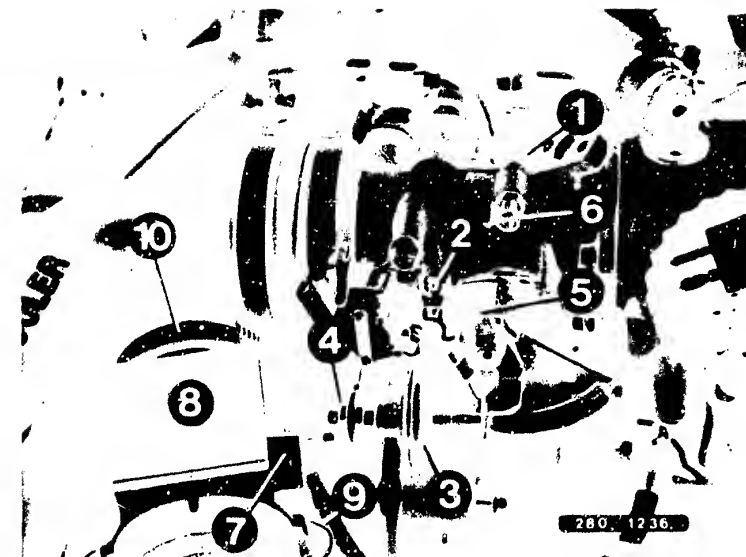
- Accelerator pedal not operated Reading 0 ... 10 Ω
- Slightly depress accelerator pedal: Reading $\infty \Omega$
- Release accelerator pedal: Reading $\infty \Omega$

After approx. 3 ... 6 s. the reading must fall to 0 ... 10 Ω

Operation OK? If not, adjustment:

Create original installation condition (connect control unit).

- Run engine until it attains operating temperature.
- Check if idle speed is 775 ... 925 min⁻¹.
If there is deviation -> adjustment:
Connect test pin to ground. Set basic engine speed to 725 ... 775 min⁻¹ with idle adjusting screw.
- Loosen locknut on throttle-valve damper.
- Increase engine speed to 2000 min⁻¹.
Adjust throttle-valve damper so that it touches the throttle-plate lever (turn throttle-valve damper to mounting → longer delay time).
Turn throttle-valve damper away from mounting → shorter delay time.
- Check delay time.
Raise engine speed to 2000 min⁻¹ and use a stop watch to measure the time span between release of accelerator pedal and attainment of idle speed (775 ... 925 min⁻¹).
The delay time must lie between approx. 3 ... 6 s. If not, replace throttle-valve damper.



- 3 = Throttle-valve damper
- 4 = Locknut (for adjusting throttle-valve damper)
- 5 = Throttle-plate lever
- 6 = Idle-speed adjusting screw

D1

Test chart for universal test adapter
SAAB 900 Turbo USA

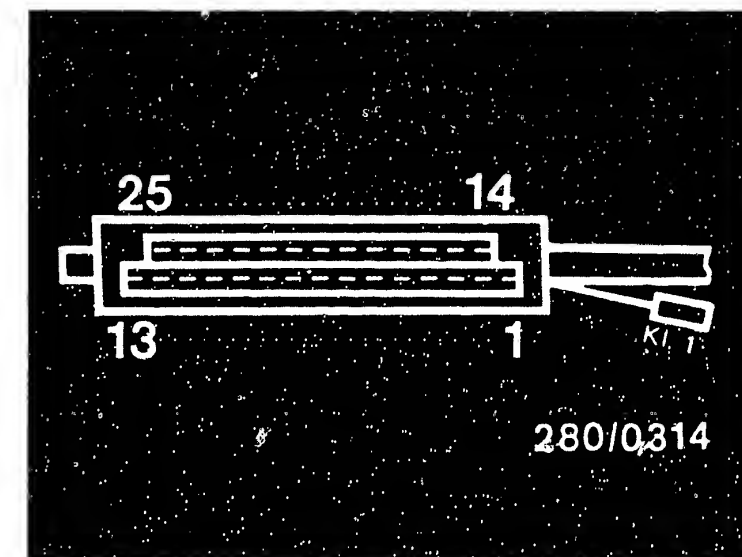


D2

Test chart for universal test adapter
SAAB 900 Turbo USA

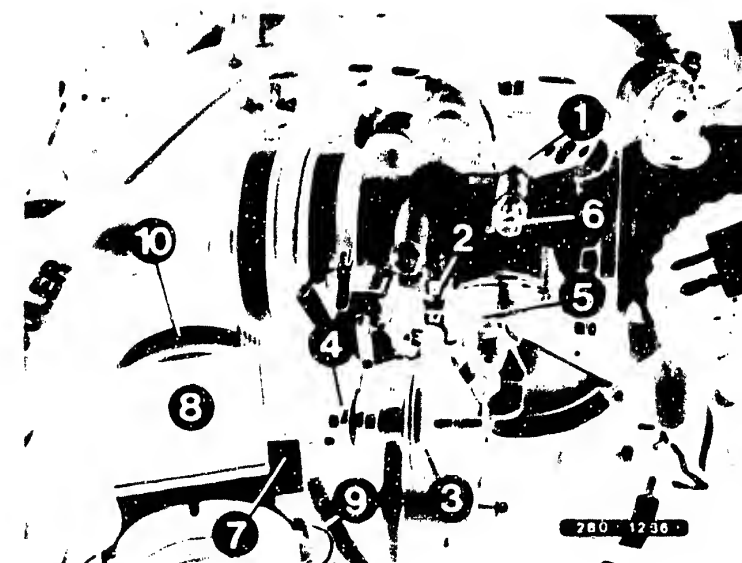


TEST STEP 6 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
<u>Program switch "V" to position:</u>	↓	Measuring equipment must show <u>0 ... 10 Ω</u>	<u>Component:</u>
<u>Program switch "Ω" to position:</u>	10		Throttle-valve switch (full-load contact)
<u>Measuring equipment:</u> Motortester/multimeter			<u>Operation:</u>
<u>Measuring range:</u> x 1 Ω			Resistance value at control unit plug term. 12 to ground terminal output stage
<u>Connection:</u>			<u>Malfunction:</u>
Blue test jacks		V	Resistance outside tolerance
<u>Operation in vehicle:</u>		yes	
Accelerator pedal in full-load position (depress fully)		Testing must continue with <u>next test step</u>	
		V	



Top view of control unit plug

1 = Throttle-valve switch



D3

Test chart for universal test adapter
SAAB 900 Turbo USA



D4

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 7 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	↓	Measuring equipment must show 0 ... 10 Ω.	<u>Components:</u> Test pin for idle-speed control
Program switch "Ω" to position:	10		
<u>Measuring equipment:</u> Motortester/multimeter		<u>Operation:</u> Resistance at control unit plug term. 12	
<u>Measuring range:</u> x 1 Ω			
<u>Connection:</u> Blue test jacks		<u>Malfunction:</u> Resistance outside tolerance	
<u>Operation in vehicle:</u> Connect test pin to ground.			
		V yes Testing must continue with next test step.	no
			V

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

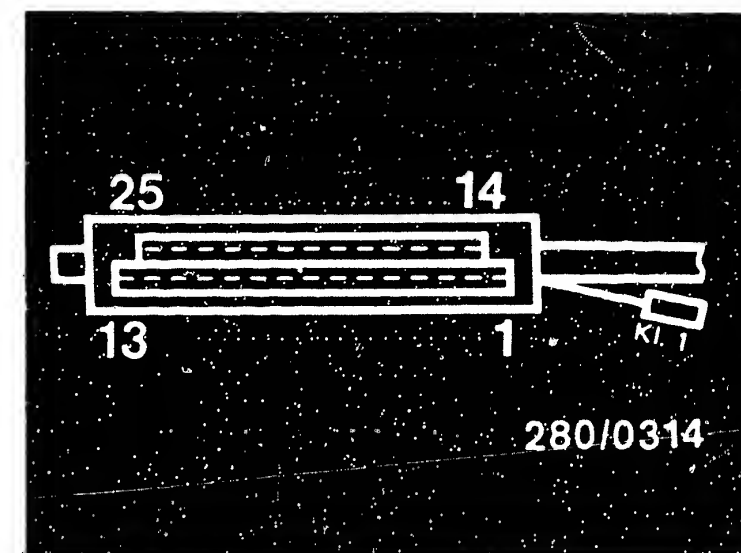
Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

- Control unit plug term. 12 to 1-pin plug connection.
- From plug connection (blue/white lead) to ground.
- Good ground connection.

Eliminate contact resistances in plug connections.
Spring contacts must not be able to be pushed back.

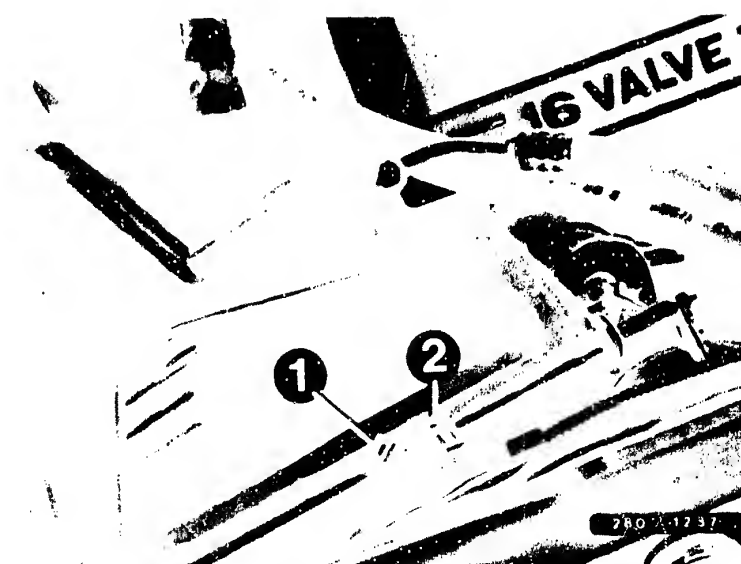
Careful!

After this test step the ground connection of the test pin must be removed again.



Top view of control unit plug

1 = One-pin plug connection



D5

Test chart for universal test adapter
SAAB 900 Turbo USA



D6

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 8 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	↓	Measuring equipment must show at ambient temperature, (+15°C ... +30°C): 20.0 ... 32 Ω; with engine at operating temperature (+80°C): 24.5 ... 37.0 Ω.	Component:
Program switch "Ω" to position:	11		Idle actuator (winding between term. 1 and term. 2)
Measuring equipment: Motortester/multitester			Operation:
Measuring range: x 1 Ω			Resistance value at control unit plug term. 10 to ground
Connection:			Malfunction:
Blue test jacks			Resistance outside tolerance
Operation in vehicle:			
---		V yes Continue testing with next test step.	no
			V

Trouble-shooting:

For testing, remove the control unit plug from test adapter, and if necessary use circuit diagram.

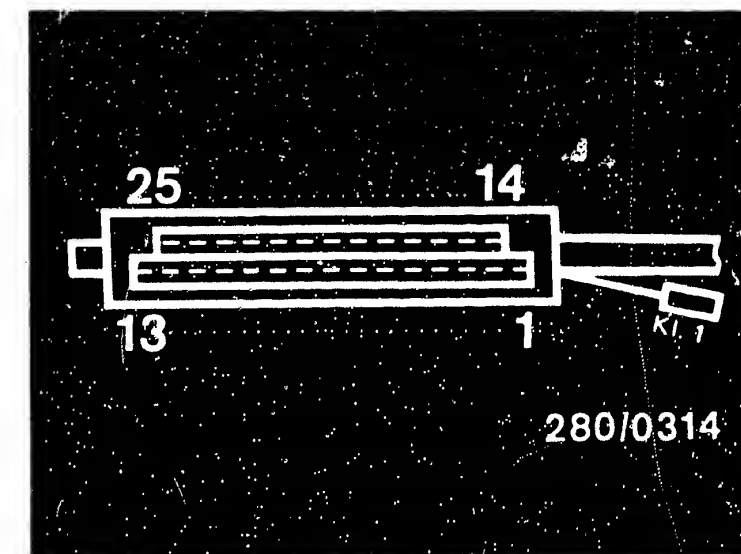
Test the following leads for continuity using ohmmeter
(Set value approx 0 Ω):

- From control unit plug term. 10 to idle actuator term. 1
- From idle actuator term. 2 to pump relay term. 87.
- Resistance measurement at idle actuator between term. 1 and term. 2.
At ambient temperature (+15°C...+30°C): 19.0 ... 25.0 Ω.

Eliminate contact resistances in plug connections.
Spring contacts must not be able to be pushed back.

Installation position of components

Pump relay: In passenger compartment in passenger's side footwell to the right below next to LH control unit.



Top view of control unit plug

4 = Idle actuator



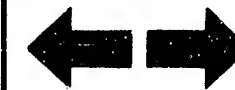
D7

Test chart for universal test adapter
SAAB 900 Turbo USA



D8

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 9 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	↓	Measuring equipment must show, at ambient temperature (+15°C... +30°C): 18 ... 29.5 Ω; with engine at operating temperature (+80°C): 22 ... 34 Ω	<u>Components:</u> Idle actuator (winding between term. 2 and term. 3). <u>Operation:</u> Resistance value at control unit plug term. 21 to ground.
Program switch "Ω" to position:	12		
Measuring equipment: Motortester/multimeter			
Measuring range: x 1 Ω			
Connection:			
Blue test jacks			
Operation in vehicle:			
---		V yes Continue test- ing next test step.	no
			V
			<u>Malfunction:</u> Resistance outside tolerance

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

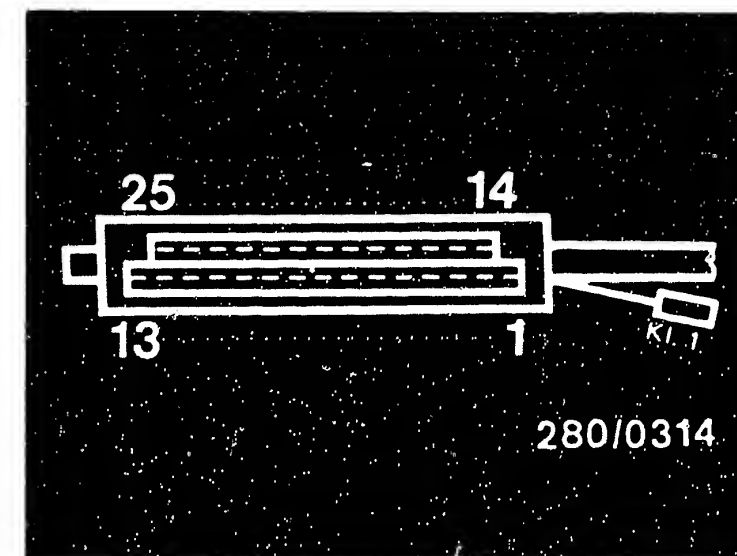
Test the following leads for continuity using ohmmeter

(Set value approx. 0 Ω):

- From control unit plug term. 23 to idle actuator.
- Resistance measurement on idle actuator between term. 3 and term. 2:
At ambient temperature (+15°C...+30°C): 17 ... 22.5 Ω.

Eliminate circuit resistances in plug connections.

Spring contacts must not be able to be pushed back.



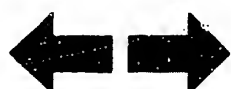
Top view of control unit plug

4 = Idle actuator



D9


Test chart for universal test adapter
SAAB 900 Turbo USA



D10

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 10 (Connect adapter lead only to peripherals)						
Operation:		Reading:		Peripherals tests		
Program switch "V" to position:			Measuring equipment must show <u>0 ... 10 Ω.</u>		Component:	
Program switch "Ω" to position:					Data encoding	
Measuring equipment: Motortester/multimeter		14		Operation:		
Measuring range: x 1 Ω				Resistance value from control unit plug term. 19 to sensors ground terminal		
Connection:				Malfunction:		
Blue test jacks		V		Resistance outside tolerance		
Operation in vehicle:		yes				
-----		Continue test- ing with next test step.		no		
				V		

Trouble-shooting:

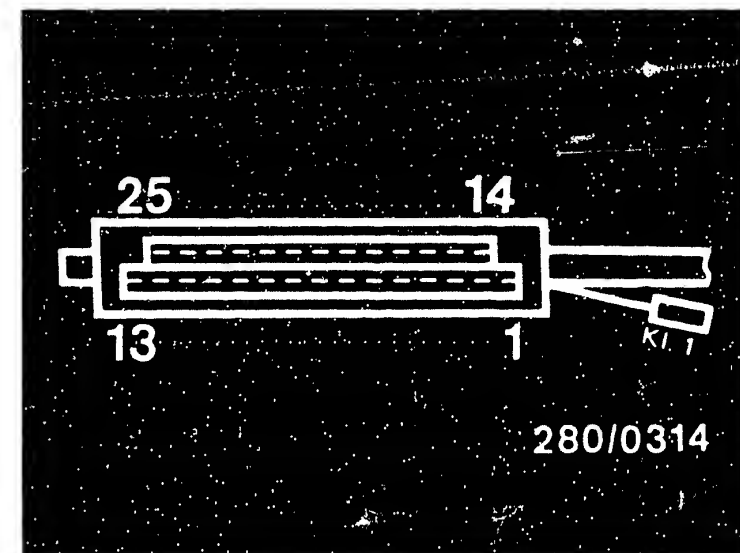
For testing, remove the control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter
(set value approx. 0 Ω):

- From control unit plug term. 19 to sensors ground terminal.

Loosen ground screws. Clean connection. Subsequently, firmly retighten screw.

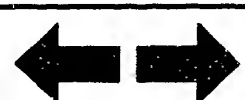
Eliminate contact resistances in plug connections.



Top view of control plug

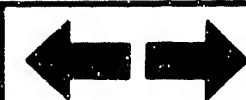
D11


Test chart for universal test adapter
SAAB 900 Turbo USA



D12

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 11 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:		Measuring equipment must show <u>150 ... 600 Ω.</u>	Component: Potentiometer in hot-wire air-mass sensor
Program switch "Ω" to position	21		
Measuring equipment: Motortester/multimeter			
Measuring range: x 1 Ω		Operation: Potentiometer for idle-mixture adjusting. Resistance at control unit plug term. 14 and term. 6	
Connection:		Malfunction:	
Blue test jacks		<div><div>V</div><div>yes</div><div>Continue test- ing with <u>next</u> <u>test step</u></div></div>	Resistance outside tolerance
Operation in vehicle:		<div><div>no</div><div>V</div></div>	

Trouble-shooting:

For testing, remove the control unit plug from the test adapter, and use circuit diagram if necessary.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

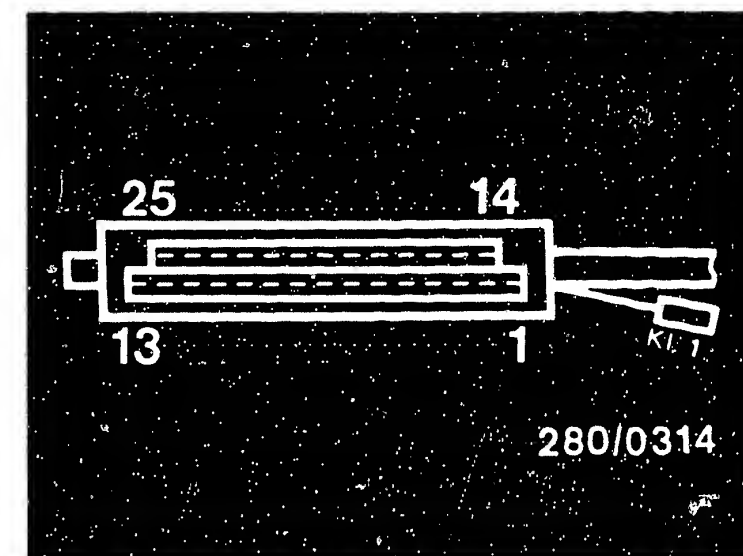
- From control unit plug term. 14 to hot-wire air-mass sensor term. 6.
- From hot-wire air-mass sensor term. 6 to control unit plug term. 6.

Measure resistance directly at hot-wire air-mass sensor between terminals 12 and 6.
(set value approx. 150 ... 600 Ω .)

Set resistance to 370 ... 390 Ω . If not possible → replace hot-wire air-mass sensor. If possible → CO setting must be checked subsequently.

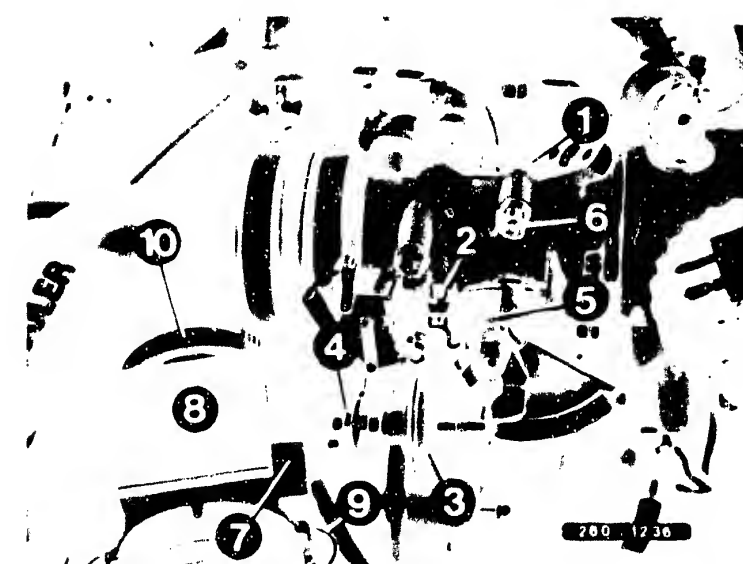
Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back.



Top view of control unit plug

7 = Potentiometer
8 = Hot-wire air-mass sensor



D13

Test chart for universal test adapter
SAAB 900 Turbo USA



D14

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 12 (Connect adapter only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	5	Until 7.85: Primary signal present (see upper diagram)	Component: Ignition coil, ignition leads, control unit
Program switch "Ω" to position:	21	From 8.85: t _D -signal (see lower diagram)	Operation: Primary signal from ignition coil term. 1 or t _D -signal from ignition trigger box term. 1. Measured against ground.
Measuring instrument: Motortester with oscilloscope			
Measuring range: Special input position % and 10 V (if present)			
Connection: Test wells. Red clip to red well, black clip to black well. Trigger clamp on cylinder 1.			Malfunction: No signal or incorrect signal
Operation in vehicle: Ignition "ON". Disengage gear and start		<div> <div>V</div> <div>yes</div> <div>Continue test- ing with next test step</div> </div> <div>no</div>	

Trouble-shooting:

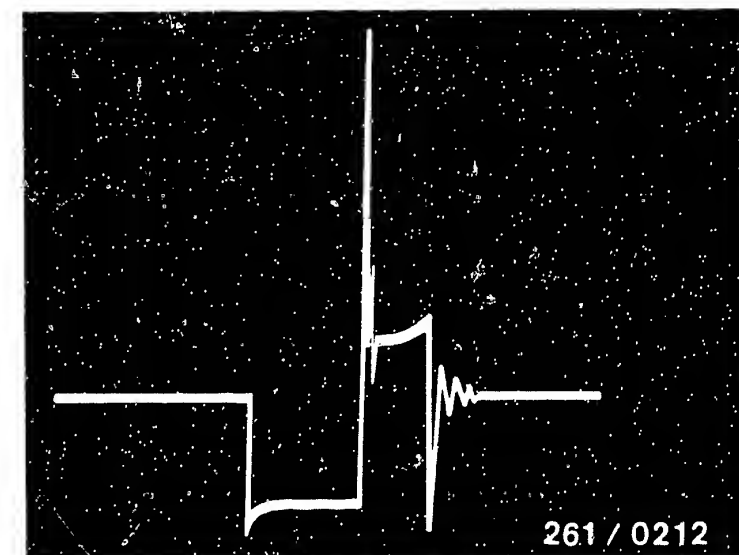
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

Until 7.85:

- From central unit to term. 1 to ignition coil term. Clamping points on ignition coil must be bare, and the screws must be firmly tightened.
- Is there voltage at ignition coil term. 1? If not, check ignition system.

See D17/D18 for continuation

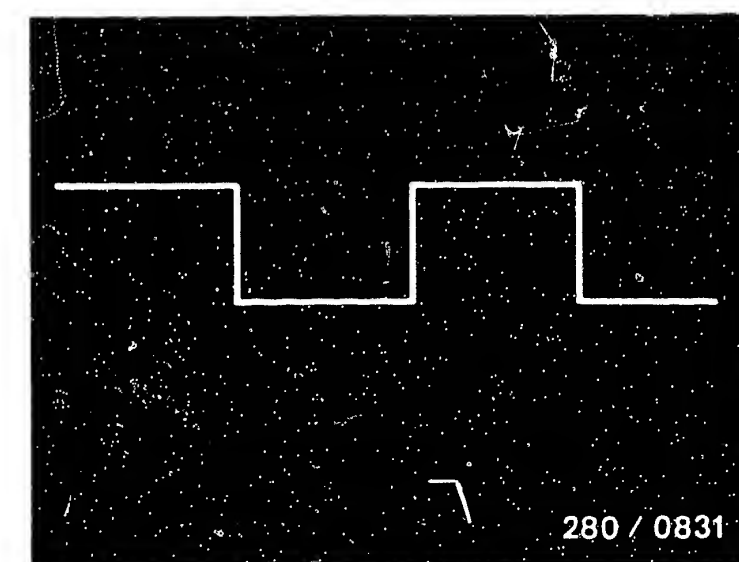


Until 7.85:

Term. 1 signal from ignition term. 1 (primary signal)

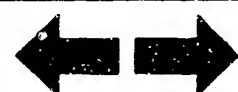
From 8.85:

t_D signal from ignition trigger box term. 1



D 15

Test chart for universal test adapter
SAAB 900 Turbo USA



D 16

Test chart for universal test adapter
SAAB 900 Turbo USA



Test step 12 (continued)

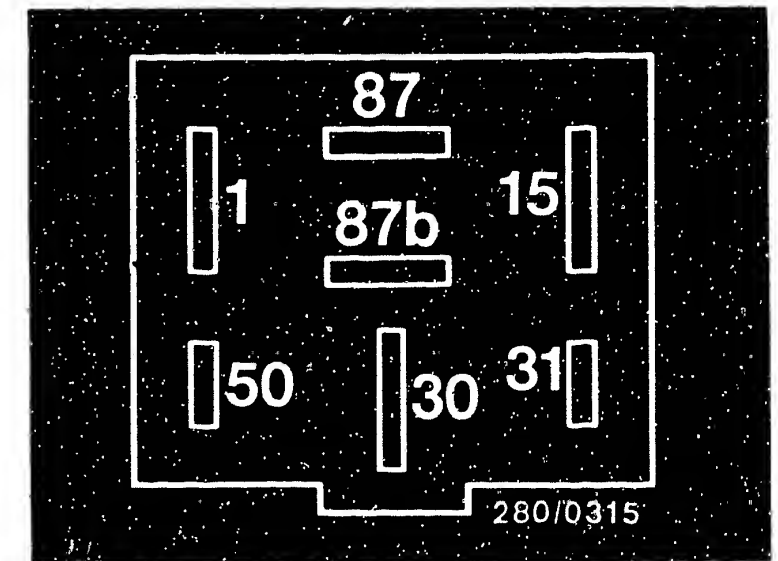
From 8.85:

- From control unit plug term. 1 via a 29-pin multiple plug term. 24 via a TSI socket term. no. 5 to ignition trigger box term. no. 1.
- Is there voltage at ignition coil term. 1?
If not, check ignition system.

Eliminate contact resistances in plug connections.
Spring contacts must not be able to be pushed back.

Installation positions of components

Ignition coil: In engine compartment diagonally forward on radiator panel.



Top view of control unit
plug

D17

Test chart for universal test adapter
SAAB 900 Turbo USA



D18

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 13 (Connect adapter lead only to peripherals)					
Operation:		Reading:		Peripherals test	
Program switch "V" to position:		6	Measuring equipment must show 8 ... 15 V.		Component: Main relay
Program switch "Ω" to position:		21			
Measuring equipment: Motortester/multimeter			Operation: Voltage supply from main relay term. 87 to control unit plug term. 9.		
Measuring range: 15 V					
Connection: Red test jack/well = positive Black test jack/well = ground			Malfunction: No voltage reading		
Operation in vehicle: Ignition "ON"					
Press button 4			V yes Continue test- ing with next test step no V		

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

- From control unit plug term. 9 to main relay term. 87.
- Careful! Disconnect battery!
- From main relay term. 30 to battery (positive connection).
- From main relay term. 30 to main relay term. 86.
- From main relay term. 85 to control unit plug term. 21.

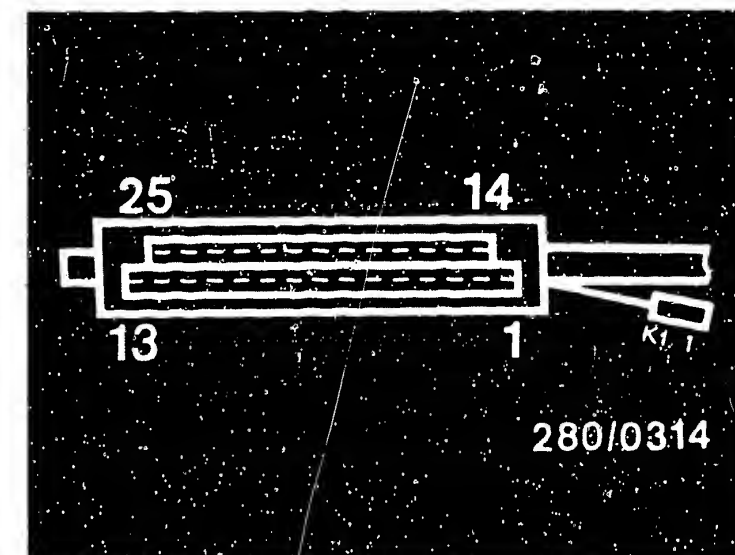
If leads are OK and test specification is not reached → replace main relay. After testing connect battery!

Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back.

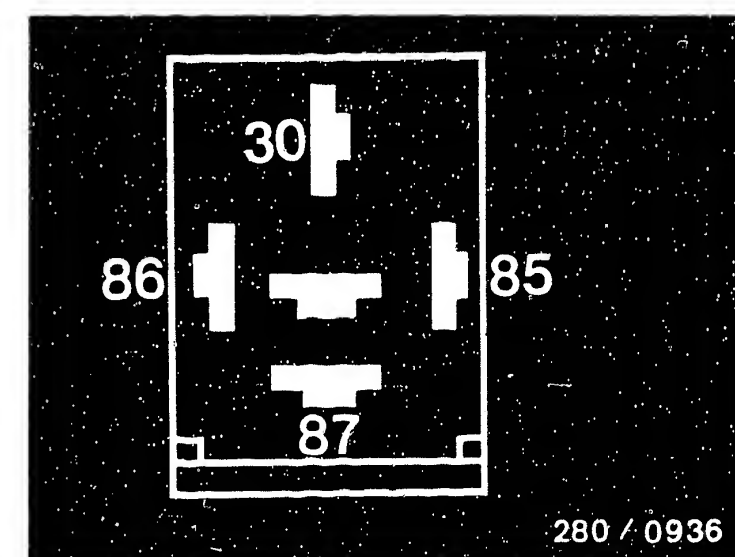
Installation position of components

Main/pump relay: In passenger compartment, passenger's side footwell on the left next to LH control unit



Top view of control unit plug

Main/pump relay removed.
Top view of plug base



D19

Test chart for universal test adapter
SAAB 900 Turbo USA



D20

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 14 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
<u>Program switch "V" to position:</u>	7	Measuring equipment must show 8 ... 15 V	<u>Component:</u>
<u>Program switch "Ω" to position:</u>	21		Ignition and starting switch
<u>Measuring equipment:</u> Motortester/multimeter			<u>Operation:</u>
<u>Measuring range:</u> 15 V			Voltage supply from term. 15 for control unit term. 18
<u>Connection:</u> Red test jack/well = Positive Black test jacks/well = Ground			<u>Malfunction:</u>
<u>Operation in vehicle:</u> Ignition "ON"		V yes Continue test- ing with <u>next test</u> <u>step.</u>	No voltage supply

Trouble-shooting:

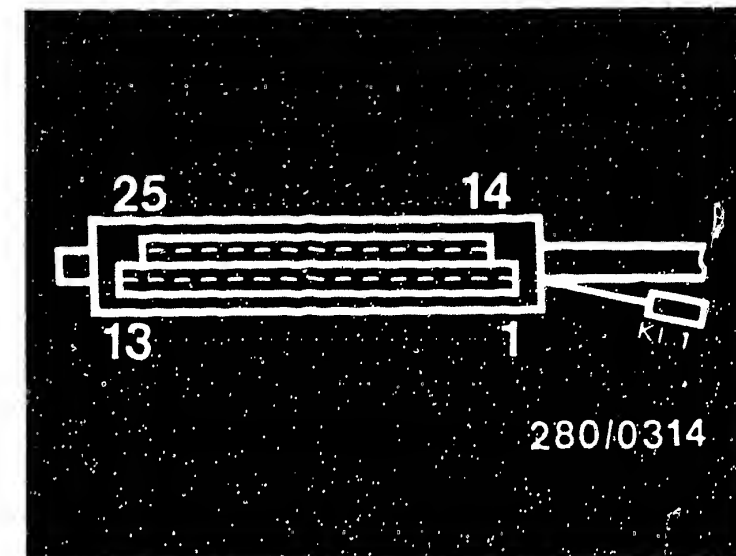
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

- From control unit plug term. 18 to ignition and starting switch term. 15 via fuse no. 22 in central fuse box (above glove compartment)

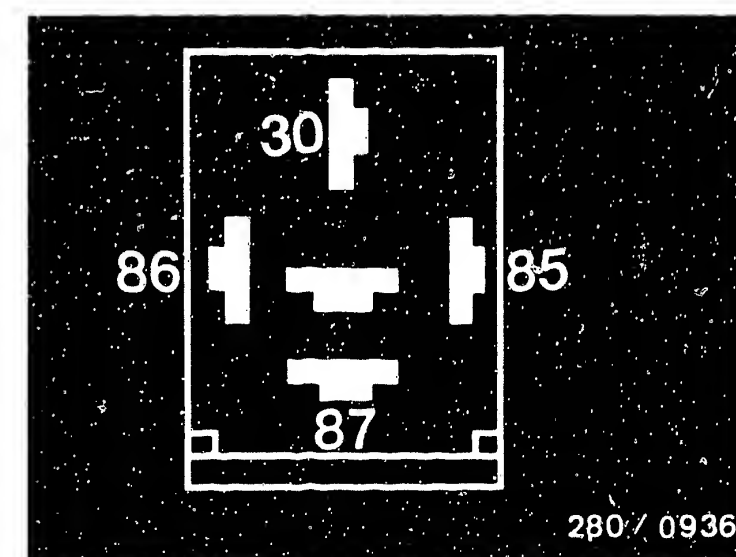
Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back.



Top view of control unit plug

Main/pump relay removed.
Top view of plug base.



D21

Test chart for universal test adapter
SAAB 900 Turbo USA



D22

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 15 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
<u>Program switch</u> "V" to position:	8	Measuring equipment must show 8 ... 15 V	<u>Component:</u> Main relay
<u>Program switch</u> "Ω" to position:	21		
<u>Measuring equipment:</u> Motortester/multimeter			<u>Function:</u> Main relay winding and ground connection to control unit term. 21
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Red test jack/well = Positive Black test jack/well = Ground			<u>Malfunction:</u> No voltage reading
<u>Operation in vehicle:</u> Ignition "ON"		V yes Continue test- ing with <u>next</u> <u>test step.</u>	no V

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter
(set value approx. 0 Ω):

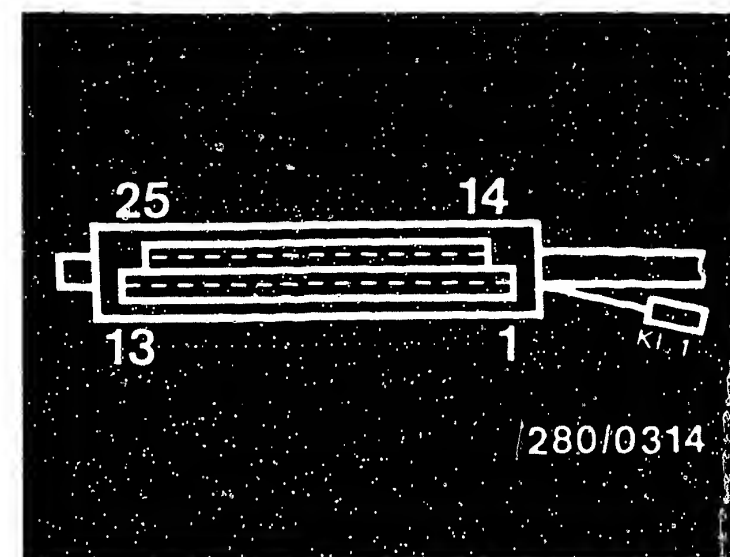
- From control unit plug term. 21 to main relay term. 85.

Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back.

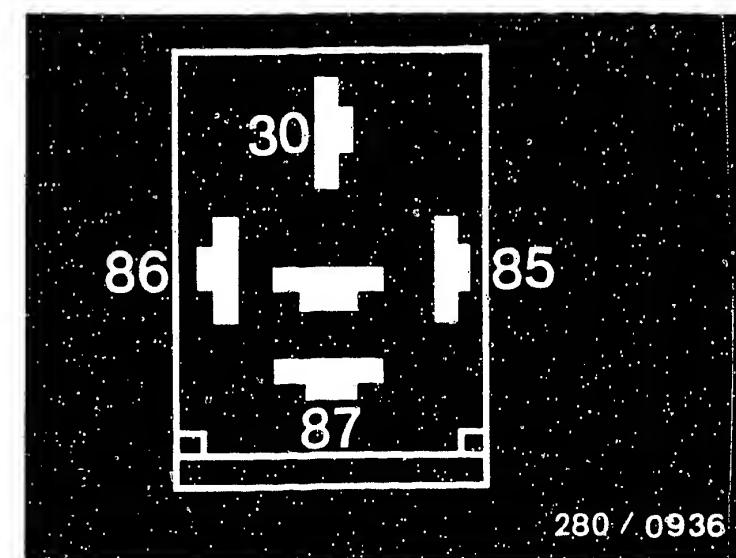
Installation position of components:

Main relay: In passenger compartment, passenger's side footwell on the right next to LH control unit.



Top view of control unit plug

Main/pump relay removed.
Top view of plug base



D23

Test chart for universal test adapter
SAAB 900 Turbo USA



D24

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 16 (Connect adapter lead only to peripherals)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	9	Measuring equipment must show 8 ... 15 V.	Components: Pump relay Pressure-sensing switch
Program switch "Ω" to position:	21		
Measuring equipment: Motortester/multimeter			Operation: Pump relay winding and ground connection to control unit term. 17
Measuring range: 15 V			
Connection: Red test jack/well = Positive Black test jack/well = Ground			
Operation in vehicle:		Malfunction:	
Ignition "ON". Press button 4.		No voltage reading	
		</	

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

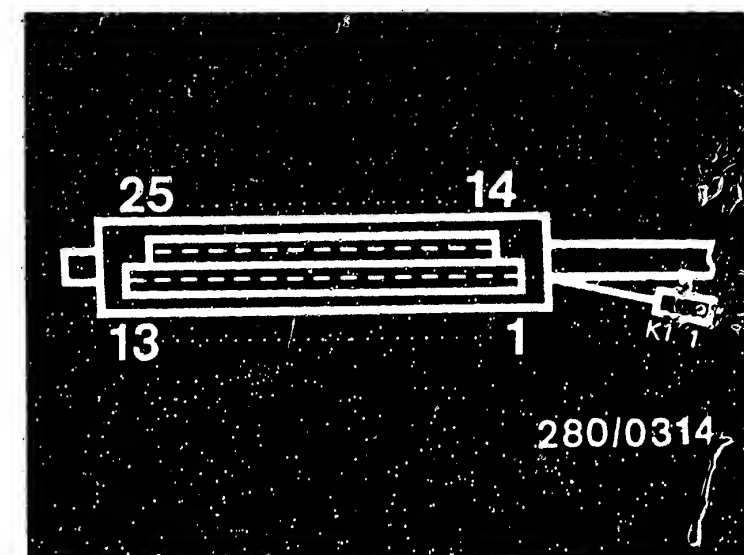
Test the following leads for continuity using ohmmeter
(set value approx. 0 Ω):

- From control unit plug term. 17 to pump relay term. 85.
- From pump relay term. 86 via pressure-sensing switch to main relay term. 87.
In case of fault, measure directly at pressure-sensing switch.
At atmospheric pressure, charge-air pressure: 0 Ω.
At or above 1.05 bar charge-air pressure the pressure-sensing switch must switch:
∞Ω.

Eliminate contact resistances in plug connections.
Spring contacts must not be able to be pushed back.

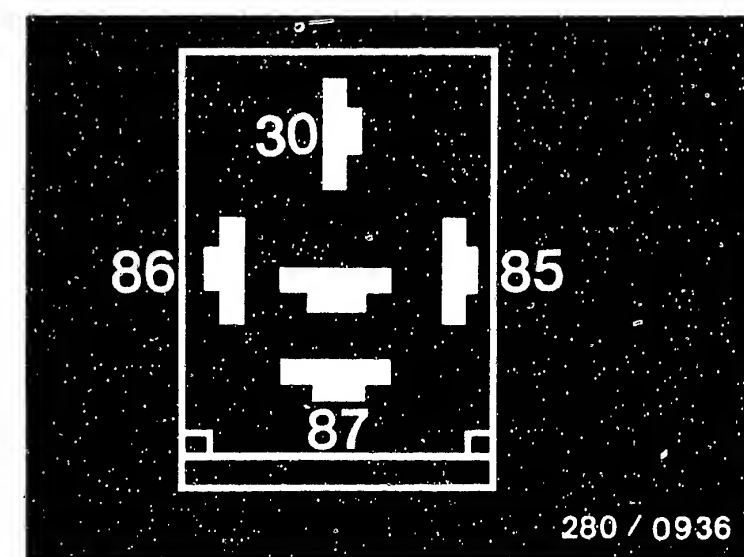
Installation position of components:

Pump relay: In passenger compartment, passenger's side footwell on the right next to LH control unit.



Top view of control unit plug

Main/pump relay removed.
Top view of plug base



E1

Test chart for universal test adapter
SAAB 900 Turbo USA



E2

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 17 (Not applicable for vehicles without air conditioning)			
Ignition "OFF", connect adapter lead to control unit and peripherals!			
<u>Operation:</u>		<u>Reading:</u>	<u>Peripherals test</u>
<u>Program switch</u>			<u>Component:</u>
<u>"V" to position:</u>	10	Measuring equipment must show 8 ... 15 V.	Air conditioner switch
<u>Program switch</u>			
<u>"Ω" to position:</u>	21		
<u>Measuring equipment:</u>		<u>Operation:</u>	
Motortester/multimeter		Voltage signal at control unit plug term. 16	
<u>Measuring range:</u>			
15 V			
<u>Connection:</u>		<u>Malfunction:</u>	
Red test jack/well = Positive			
Black test jack/well = Ground			
		V	
<u>Operation in vehicle:</u>		yes	
Ignition "ON". Let engine run. Switch on a/c system. (Auto or AC button)		Continue test-	no
		ing with	
		<u>next test</u>	
		<u>step.</u>	
			V

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter

(set value approx. 0 Ω):

- From control unit plug term. 16 to air conditioner switch.
- From air conditioner switch to ignition and starting switch term. 15.

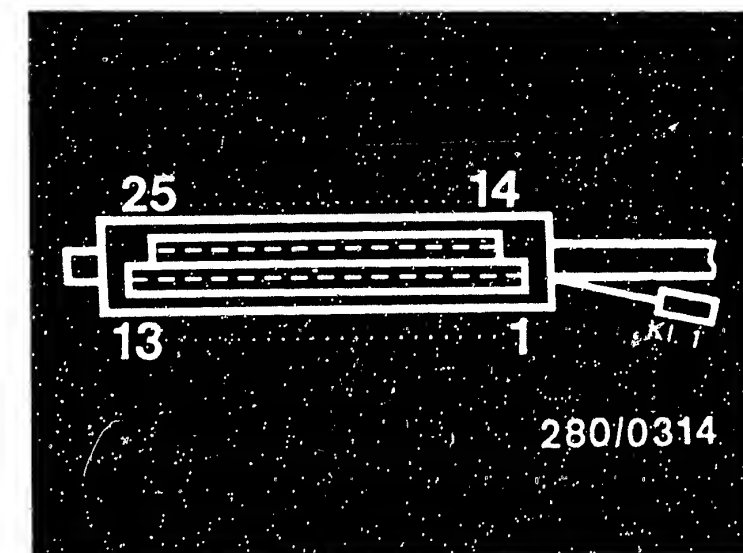
If voltage is present at term. 15 and at the air conditioner switch and lead is OK → replace air conditioner switch.

Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back.

Installation position of components:

Air conditioner: Air conditioner switch in middle of instrument panel (auto or AC button).

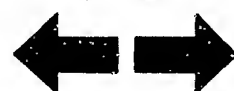


280/0314

Top view of control unit plug

E3

Test chart for universal test adapter
SAAB 900 Turbo USA



E4

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 18 (Connect adapter lead to control unit and peripherals!)			
Operation:		Reading:	Peripherals test
Program switch "V" to position:	3	Measuring equipment must show 2 ... 5 V	Component:
Program switch "Ω" to position:	21		Hot-wire air-mass sensor
Measuring equipment: Motortester/multimeter			Operation:
Measuring range: 10 V			Output voltage between term. 7 and term. 6 on control unit plug
Connection: Red test jack/well = Positive Black test jack/well = Ground			Malfunction:
Operation in vehicle: Let engine run. With engine speed changes → also output voltage change		V yes Continue test- ing with next test step.	No voltage reading No voltage change
			V

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter
(set value approx. 0 Ω):

- From control unit plug term. 7 to air-mass sensor term. 5.
- From air-mass sensor term. 4 to sensor ground terminal.
- From air-mass sensor term. 2 to main relay term. 87b.

Note: If there is change in engine speed there must also be change in output voltage.
Eliminate contact resistance in plug connections.

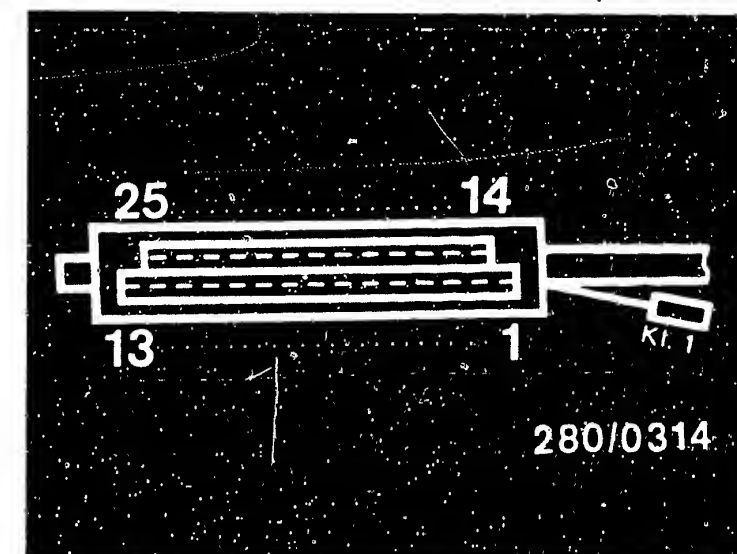
Spring contacts must not be able to be pushed back.

Installation position of components:

Air-mass sensor: Between air filter and intake manifold in engine compartments to the left.

Ground terminal: Forward fastening bolt on fuel-distribution pipe, engine compartment center.

Main relay: In passenger compartment, passenger's side footwell on the left next to LH control unit.



Top view of control unit plug

E5

Test chart for universal test adapter
SAAB 900 Turbo USA



E6

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 19 (Connect adapter lead to control unit and peripherals!)					
Operation:		Reading:		Peripherals test	
<u>Program switch</u> "V" to position:		11	Measuring equipment must show <u>10 ... 13 V</u>		<u>Component:</u> Control unit
<u>Program switch</u> "Ω" to position:		21*			
<u>Measuring equipment:</u> Motortester/multimeter				<u>Operation:</u> Lambda closed-loop control value term. 22	
<u>Measuring range:</u> 20 V					
<u>Connection:</u> Red test jack/well = Positive Black test jack/well = Ground				<u>Malfunction:</u> Voltage outside tolerance	
<u>Operation in vehicle:</u> Let engine run at operating temperature. Separate probe lead coupling.		V yes Continue test- ing with <u>next test</u> <u>step.</u>		no	
				V	

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

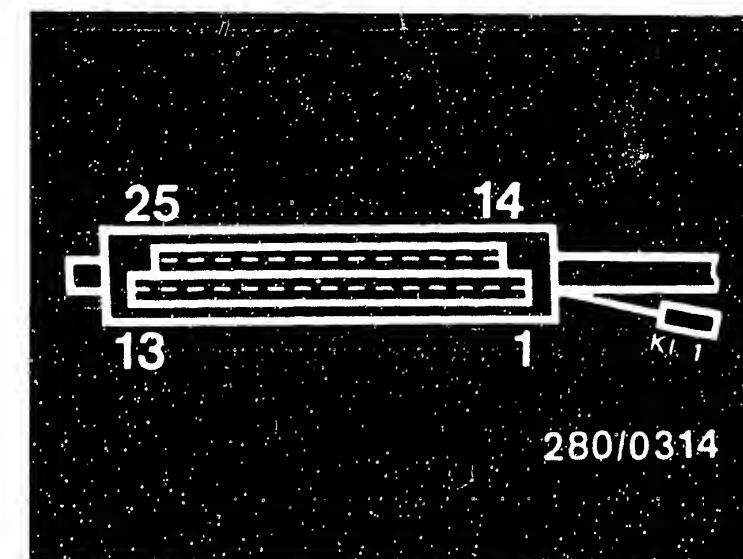
- From control unit plug term. 22 to test connection.

Eliminate contact resistances in plug connections.

Spring contacts must not be able to be pushed back..

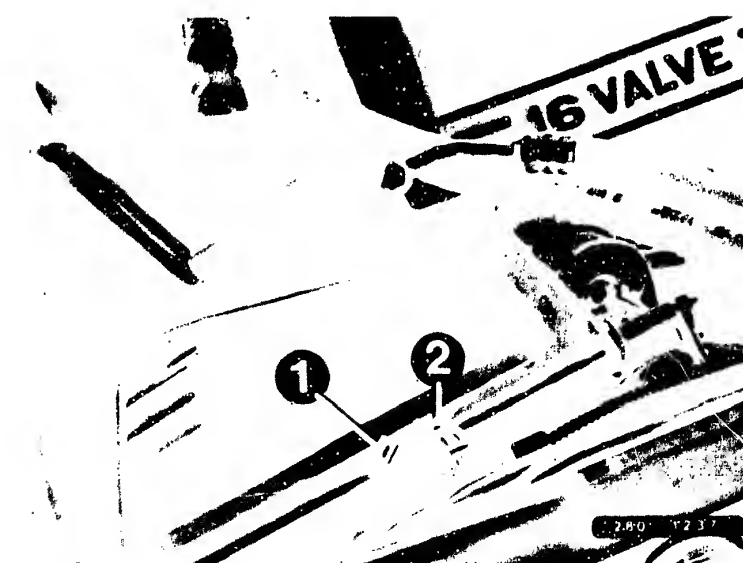
If no fault can be located but reading is still wrong → replace control unit.

* Ω-positions 22, 23 and 24 must be avoided!.



Top view of control unit plug

2 = 3-pin plug connection;
lambda test connection
(green lead)



E7

Test chart for universal test adapter
SAAB 900 Turbo USA



E8

Test chart for universal test adapter
SAAB 900 Turbo USA



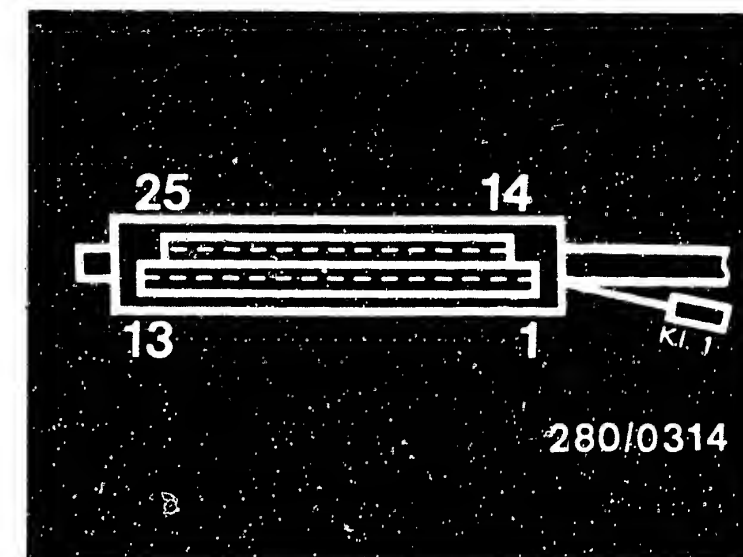
TEST STEP 20 (Connect adapter lead to control unit and peripherals)			
Operation		Reading	Control unit test
<u>Program switch</u> "V" to position:	11	Measuring equipment must show 10 ... 13 V (wait for statistical reading).	<u>Component:</u> Control unit
<u>Program switch</u> "Ω" to position:	22		
<u>Measuring equipment:</u> Motortester/multimeter			<u>Operation:</u> Lambda closed-loop control rich value term. 22
<u>Measuring range:</u> 20 V			
<u>Connection:</u> Red test jack/well = positive Black test jack/well = ground			
<u>Operation in vehicle:</u> Allow engine to run at operating temperature		V	<u>Malfunction:</u> Voltage outside tolerance
		yes	
	Continue testing with <u>next test</u> <u>step.</u>	no	
		V	

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Voltage value should slowly increase to set value. C0 must increase!

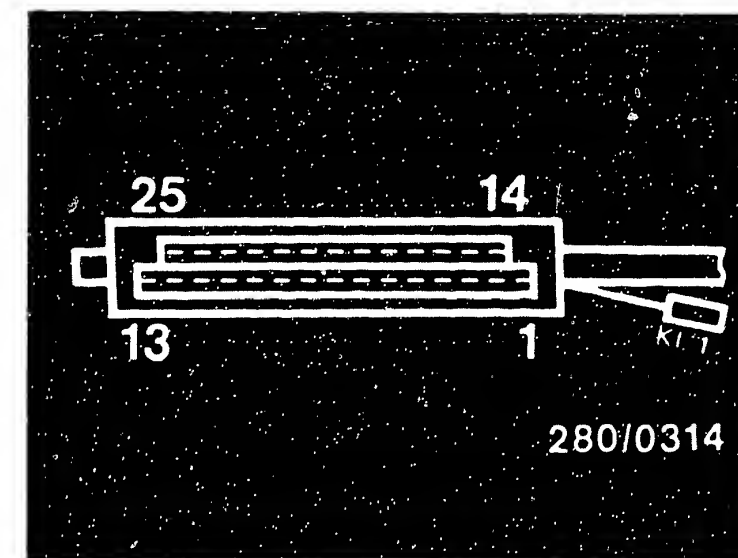
If no fault can be located but reading is still incorrect → replace control unit.



Top view of control unit plug



TEST STEP 21 Connect adapter lead to control unit and peripherals!			
Operation		Reading	Control unit test
Program switch "V" to position:	11	Measuring equipment must show less than 0.5 V (wait for statistical reading).	Component: Control unit
Program switch "Ω" to position:	23		
Measuring equipment: Motorlesler/multimeter			Operation: Lambda closed-loop control lean value term. 22
Measuring range: 5 V			
Connection: Red test jack/well = Positive Black test jack/well = Ground		Malfunction: Voltage greater than tolerance figure	
Operation in vehicle: Allow engine to run at operating temperature		V yes Continue testing with next test step.	no V



Top view of control unit plug

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Voltage value should slowly regulate to set value.

If no fault is located but reading is still incorrect → replace control unit.

E11

Test chart for universal test adapter
SAAB 900 Turbo USA



E12

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 22 Connect adapter lead to control unit and peripherals				
Operation		Reading		Control unit test
Program switch "V" to position:	11	Measuring equipment must show 0 ... 13 V (alternately).		Component: Control unit
Program switch "Ω" to position:	24			
Measuring equipment: Motorlesler/multimeter				Operation: Lambda closed-loop control Control value term. 22
Measuring range:	5 V			
		yes	no	
Connection: Red test jack/well = Positive Black test jack/well = Ground		V		Malfunction: Voltage constant or outside of tolerance
Operation in vehicle: Allow engine to run at operating temperature. Probe lead coupling plugged in.		Continue testing with next test step.		
			V	

Trouble-shooting:

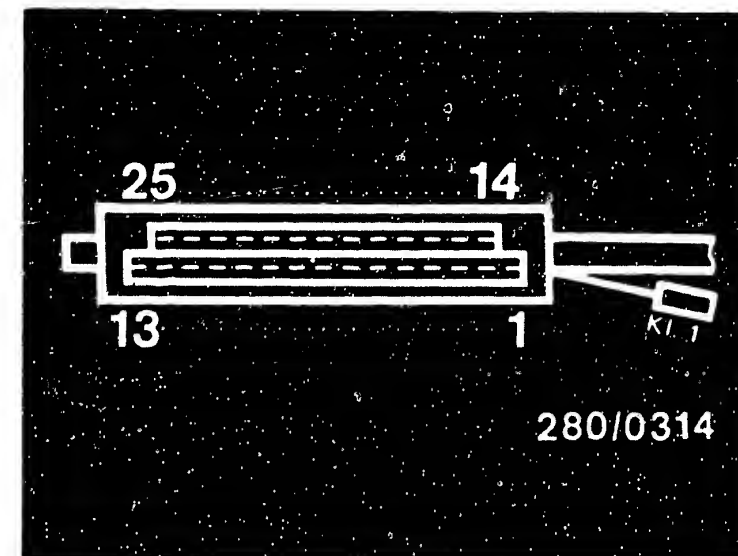
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Reading must alternate back and forth between the lean value approx. 0 V and the rich value up to approx. 13 V. (Engine and sensor must be hot!)

If reading is constant or outside of tolerance:

- Check peripherals.
- Run vehicle to operating temperature and repeat test
- If no fault is located but reading is still incorrect → replace control unit.

See E15/E16 for continuation



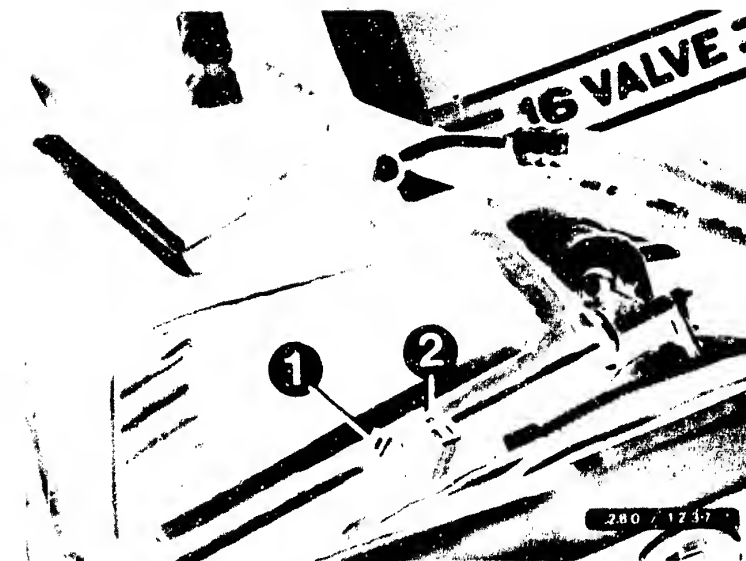
Top view of control unit plug

Test Step 22 (continuation)

Sensor correctly pre-warmed?

Let engine run for 30 sec at 3000 min⁻¹. Idle, voltage value now fluctuates back and forth.

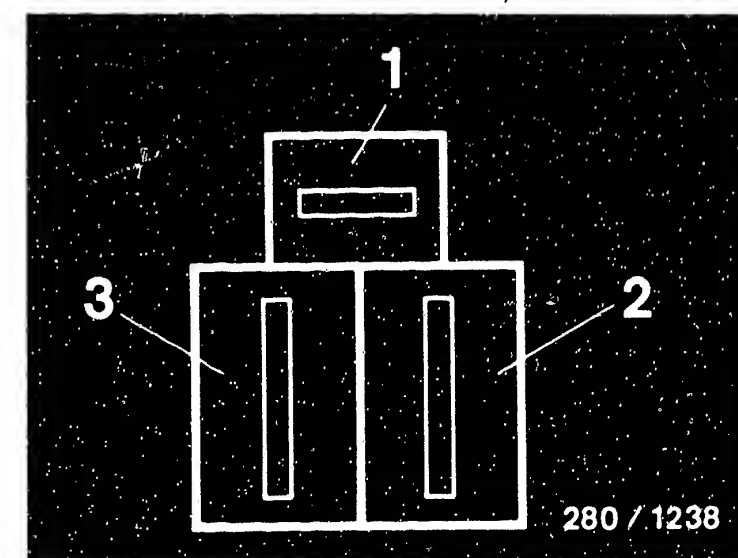
- If not, ignition "OFF". Sensor lead at coupling point not correctly plugged, contact resistances? Check and if necessary remedy.
Does idle voltage value now fluctuate? If not, ignition (OFF), loosen sensor coupling. Check following leads for continuity:
- From control unit plug term. 20 to electronics ground terminal. Set value $\infty \Omega$.
- Connect lead from control unit term. 20 to the coupling point to ground.
Set value approx. 0 Ω .
Replace lead if faulty. Careful! Sensor lead must be shielded.
The lambda sensor may not be directly tested with a multitester. Test current can destroy lambda sensor! Connect sensor coupling. Let engine run (3000 min⁻¹ 30 sec). Idle, voltage value now alternating back and forth? If not, ignition "OFF". Check following leads for continuity:
- From control unit plug term. 22 to 3-pin plug connection (green lead).
Set value approx. 0 Ω . Replace lead if faulty. Idle voltage value now alternating back and forth? If not →
- Lambda sensor defective. When installing new sensor use grease VS 140 16 Ft.
- LH control unit defective.



2 = 3-pin connection

3-pin test plug:

- 1 = Positive from pump relay term. 87
- 2 = Limp-home
- 3 = Lambda integrator-voltage output



E15

Test chart for universal test adapter
SAAB 900 Turbo USA



E16

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 23 Connect adapter lead to control unit and peripherals!				
Operation		Reading		Control unit test
Program switch		Measuring equipment		Component: Control unit
"V" to position:	11	must show		
		750 min ⁻¹		
Program switch		775...925 min ⁻¹ 1)		
"Ω" to position:	24			
Measuring equipment:				Operation: Basic idle setting (Connect test pin to ground)
Motortester/pocket tester				
Measuring range:				
Rotation-speed range				
Connection:				Malfunction: Engine speed outside tolerance
Ignition coil term. 15 and term. 1		-----		
		V		
Operation in vehicle:		yes		
Allow engine to run at operating speed. Connect test pin to ground.		Continue		no
		testing with		
		next test		
		step.		
				V

Trouble-shooting:

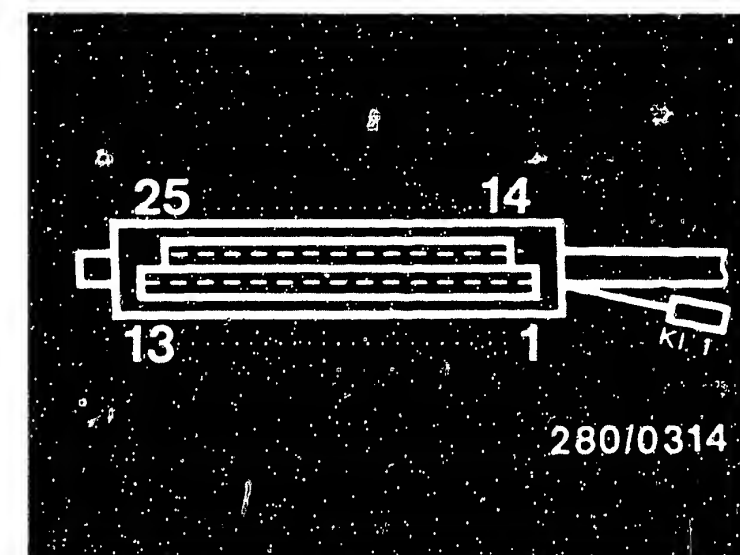
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

- No alternation in engine speed when test pin at ground → replace control unit
- Engine speed outside tolerance when test pin at ground:
Apply test pin to ground. Ensure good connections. Adjust engine speed to $725 \dots 775 \text{ min}^{-1}$ with the idle-speed-adjusting screw.

Engine speed cannot be adjusted →

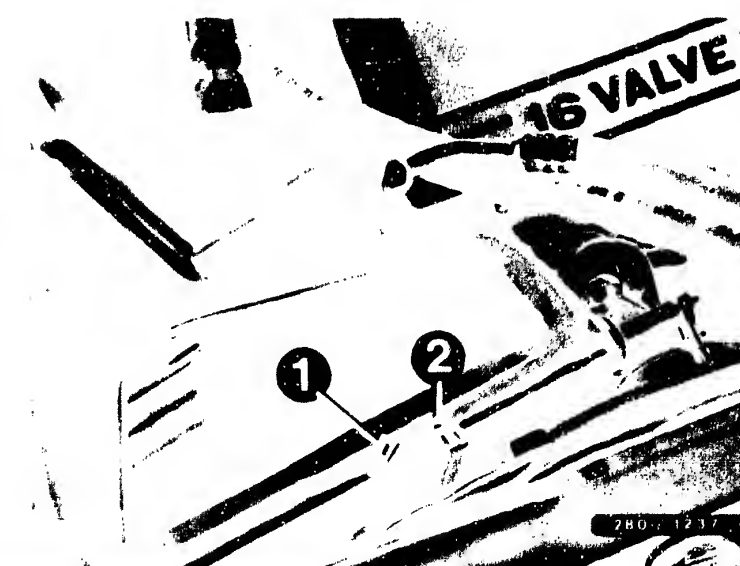
- Check for good test pin ground connection
- Replace control unit.

1) Reading when test pin not applied to ground.



Top view of control unit plug

1 = 1-pin plug connection (test pin)



E17

Test chart for universal test adapter
SAAB 900 Turbo USA

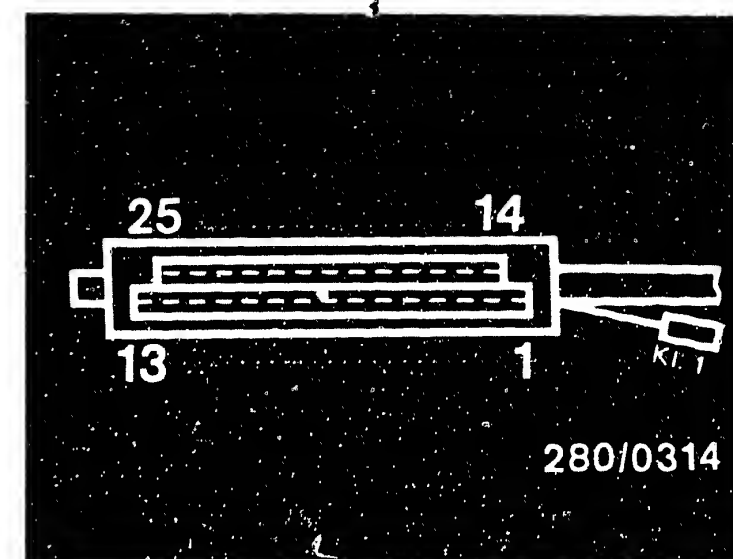


E18

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 24 Connect adapter lead to control unit at peripherals!				
Operation		Reading		Control unit test
Program switch "V" to position:		11	Measuring equipment must show	
			29.9 %	1)
Program switch "Ω" to position:			32 %	2)
			34...39 %	3)
			39...44 %	4)
Measuring equipment: Motortester/pocket tester			greater than 36 % 5)	
Measuring range: Dwell angle 100 %				
Connection: Black test jacks nos. 1 and 2				
Operation in vehicle: Allow engine to run at operating temperature. Further information under *				
			V	
			yes	
			Continue testing with next test step.	no
				V
			Malfunction: On-off ratio lies outside tolerance	



Top view of control unit plug

- * 1) = Reading for: Connect test pin to ground.
 2) = Reading for: When test pin away from ground, on-off ratio must be 32 %. If not, adjust at idle-speed-adjusting screw.
 3) = Reading for: Apply throttle, maintain engine speed at 1600 min⁻¹.
 4) = Reading for: Maintain engine speed at approx. 1600 min⁻¹ and switch on a/c (where present).
 5) = Reading for: Apply throttle, engine speed above 3000 min⁻¹, on/off ratio must become greater.

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

If reading is outside of tolerance → check whether settings have been maintained.

If settings OK → replace control unit.

E19

Test chart for universal test adapter
SAAB 900 Turbo USA



E20

Test chart for universal test adapter
SAAB 900 Turbo USA



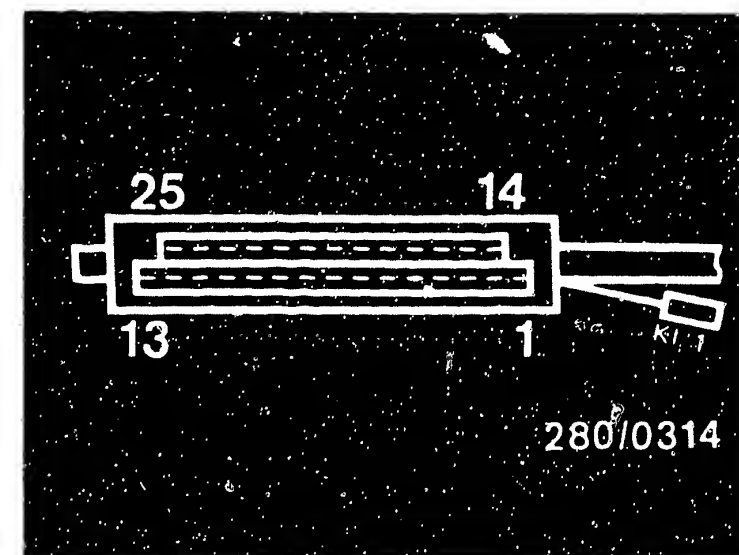
TEST STEP 25 (Connect adapter lead to control unit and peripherals!)			
Operation		Reading	
Program switch "V" to position:		Measuring equipment must show injection signal	
Program switch "Ω" to position:		(see lower figure).	
Measuring equipment: Ignition oscilloscope		Operation: Output stage (final stage)	
Measuring range: ms or 20 V special input		yes	no
Connection: Red test jack/well = Positive Black test jack/well = Ground		V	
Operation in vehicle: Allow engine to run at operating temperature.		Continue testing with next test step	
			Malfunction: No injection signal or incorrect one

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

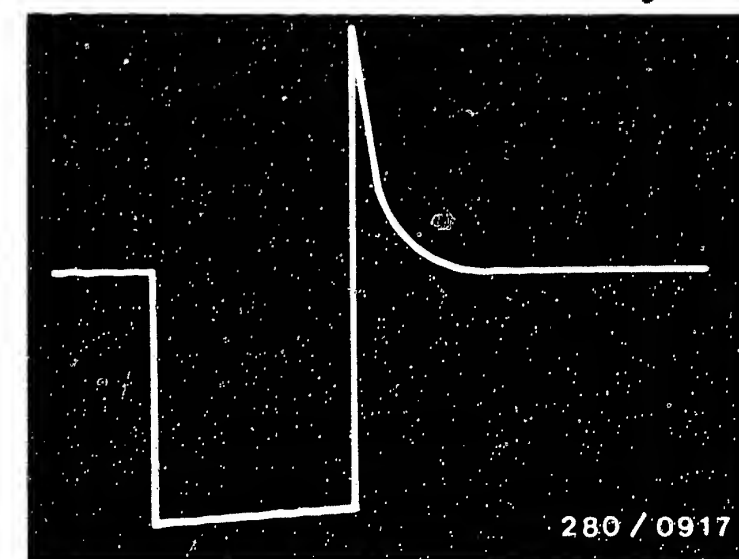
Is no injection signal visible on the oscilloscope? → Change triggering (apply clamp-on induction pickup to a different cylinder).

If no injection signal or wrong one → replace control unit.



Top view of control unit plug

Injection signal



E21

Test chart for universal test adapter
SAAB 900 Turbo USA



E22

Test chart for universal test adapter
SAAB 900 Turbo USA

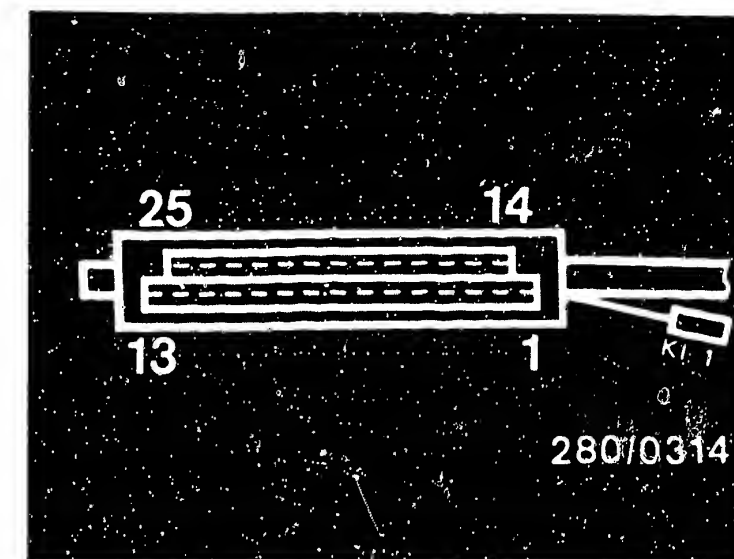


TEST STEP 26 (Connect adapter lead to control unit and peripherals!)			
Operation	Reading		Control unit test
Program switch "V" to position:	12	Measuring equipment must show injection signal.	Component: Control unit
Program switch "Ω" to position:	24	After pressing key T1 (NTC II - cold) the injection signal must become wider (see lower figure) and/or engine speed increases	Operation: Warm-up Temperature influence cold (engine)
Measuring equipment: Ignition oscilloscope	Press key only for short time! (Engine enriches severely)		Malfunction: After pressing key T1 injection signal does not become wider
Measuring range: ms, 20 V special input			
Connection: Red test jack/well = Positive Black test jack/well = Ground			
Operation in vehicle: Allow engine to run at operating temperature.	V yes	no	
Push key T1.	Continue test- ing with next test step.	V	

Trouble-shooting:

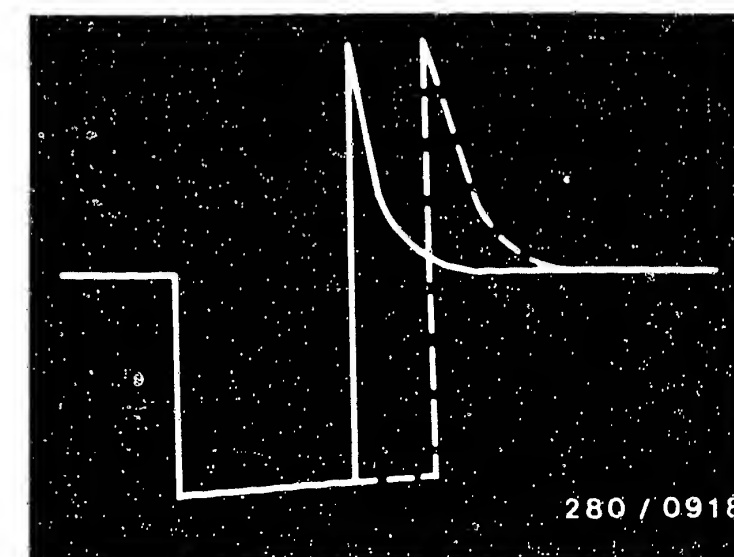
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

If injection impulse does not become wider → replace control unit.



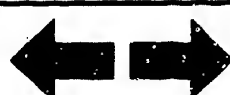
Top view of control unit plug

Widened injection signal after pressing key T 1



E23

Test chart for universal test adapter
SAAB 900 Turbo USA



E24

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 27 (Connect adapter lead to control unit and peripherals!)			
Operation		Reading	Control unit test
Program switch "V" to position:	12	Measuring equipment must show injection signal.	Component: Control unit
Program switch "Ω" to position:	24	After pressing button T 2 the injection signal must <u>not</u> become wider (see lower figure).	
Measuring equipment: Ignition oscilloscope			Operation: Warm-up regulated Warm temperature influence (engine)
Measuring range: ms, 20 V - Special input			
Connection: Red test jack/well = Positive Black test jack/well = Ground	yes V	no V	Malfunction: After pressing key T 2 the injection signal becomes wider
Operation in vehicle: Allow engine to run at operating temperature.	Continue testing with <u>next</u> test step.		
Press key 2.		V	

Trouble-shooting:

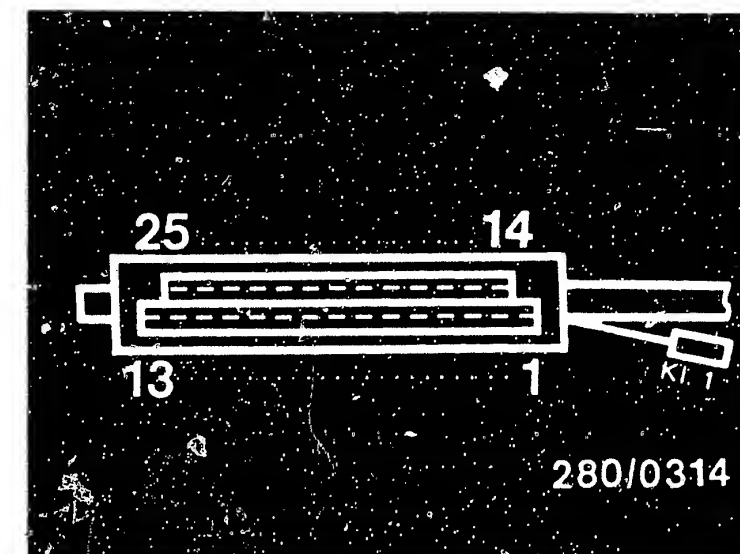
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

Injection signal must not become wider.

If injection signal does get wider, engine is not at operating temperature.

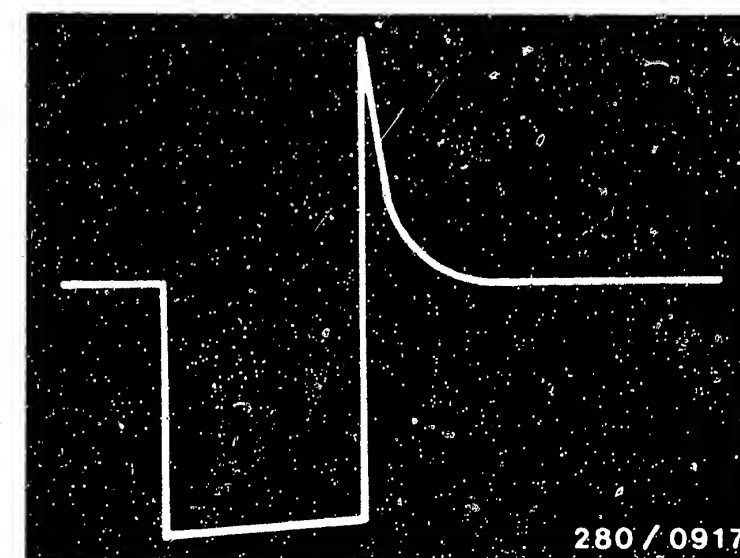
Let engine run approx. 5 min. 3000 min⁻¹.
Repeat test.

If fault not remedied → replace control unit.



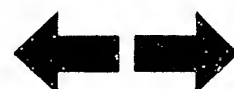
Top view of control unit plug

Injection signal



F1

Test chart for universal test adapter
SAAB 900 Turbo USA



F2

Test chart for universal test adapter
SAAB 900 Turbo USA



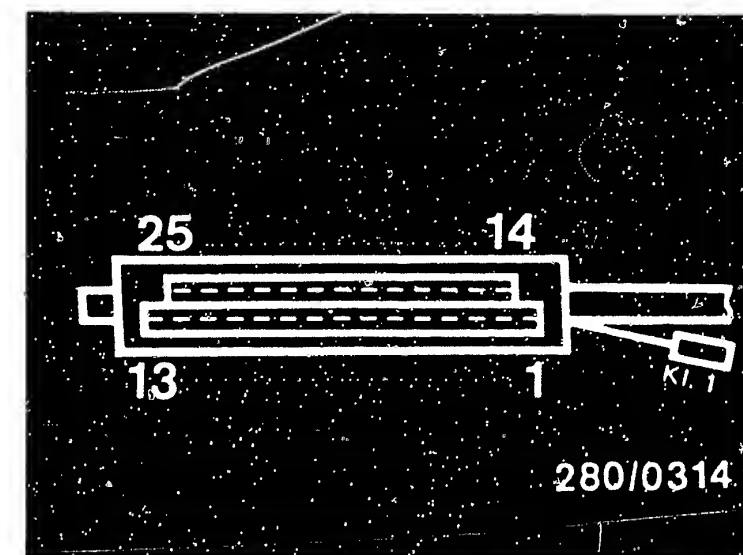
TEST STEP 28 (Connect adapter lead to control unit and peripherals!)			
Operation		Reading	Control unit test
Program switch "V" to position:		12	Measuring equipment must show injection impulse.
Program switch "Ω" to position:		24	After pressing key T 6 (full-load enrichment) the injection signal must become somewhat wider and/or the engine speed become somewhat higher (see lower figure).
Measuring equipment: Ignition oscilloscope			Operation: Full-load enrichment
Measuring range: ms, 20 V special input			
Connection: Red test jack/well = Positive Black test jack/well = Ground			Malfunction: Injection signal does not become wider
Operation in vehicle: Allow engine to run at operating temperature.		V yes	
Press key 6		Continue testing with next test step.	
		no	
		V	

Trouble-shooting:

For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

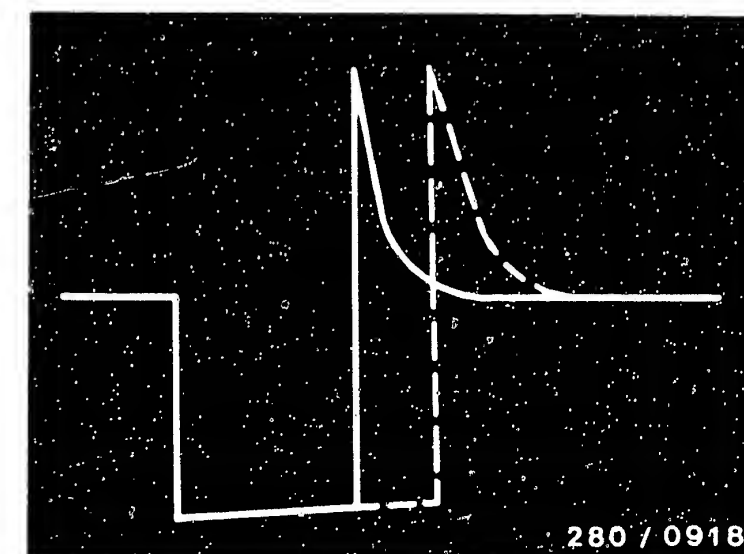
If injection impulse does not become wider → engine speed must increase.

If injection signal does not become wider or engine speed does not increase → replace control unit.



Top view of control unit plug

Wider injection signal after pressing key T 6



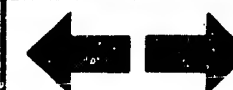
F3

Test chart for universal test adapter
SAAB 900 Turbo USA



F4

Test chart for universal test adapter
SAAB 900 Turbo USA



TEST STEP 29 (Connect adapter lead to control unit and peripherals!)			
Operation		Reading	Control unit test
Program switch "V" to position:	13	Measuring equipment must after approx. 4 sec show a voltage value of 2 ... 5 V (reading duration approx. 1 sec).	Component: Control unit
	24		
Program switch "Ω" to position:			
Measuring equipment: Motortester/multimeter			Operation: Self-cleaning; Voltage pulse at control unit plug term. 8 to term. 11
Measuring range: 10 V			
Connection: Red test jack/well = Positive Black test jack/well = Ground			Malfunction: Lasting pulse or no pulse
Operation in vehicle: Allow engine to run at operating temperature at min. 2000 min ⁻¹ . Then ignition "OFF".			
		yes	
		Continue	no
		testing with	
		next test	
		step.	
			V

Trouble-shooting:

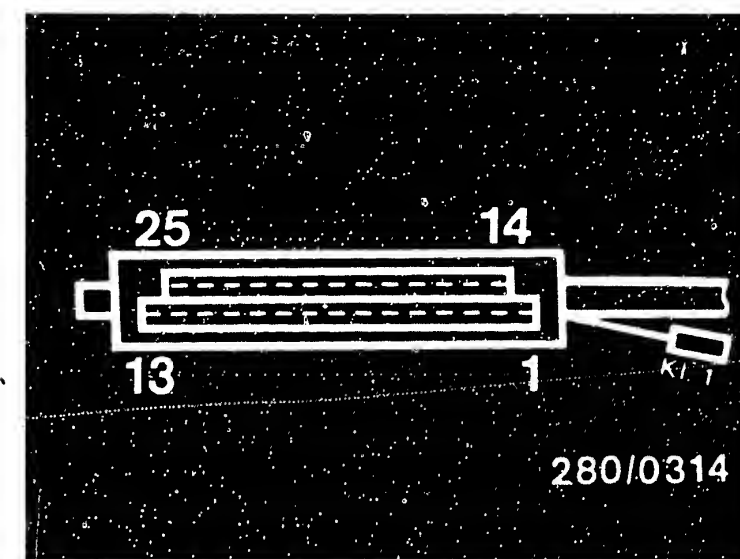
For testing, remove control unit plug from test adapter, and if necessary use circuit diagram.

If self-cleaning pulse does not correspond to reading → remove hot-wire air-mass sensor, leave plug plugged in.
Repeat test step 19 while observing hot wire.
Hot wire must glow about 1 sec after approx. 4 sec.

Hot wire glows: check connections and measuring equipment settings.

Hot wire does not glow:

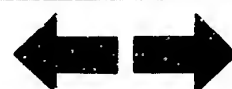
- Engine temperature under +60°C? Let engine warm up.
- Hot wire in hot-wire air-mass sensor broken → replace hot-wire air-mass sensor.
- Control unit defective → replace.



Top view of control unit plug

F5

Test chart for universal test adapter
SAAB 900 Turbo USA



F6

Test chart for universal test adapter
SAAB 900 Turbo USA



Testing with the universal test adapter is concluded.

The fuel pressure test must now be carried out.

If a fault is found during testing, the test must be repeated after the fault has been remedied.

The fuel pressure test is described on Coordinates F8 ... G4.

F7

Test chart for universal test adapter
SAAB 900 Turbo USA



FUEL PRESSURE TEST

In-tank electric fuel pump and pre-supply pump operating? (listen)

no

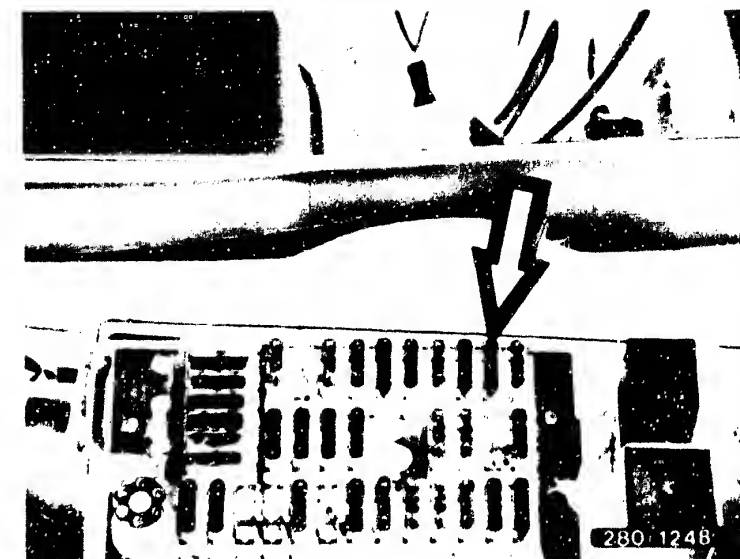
Check pump fuse

- Pump fuse no. 30 in central fuse box (to the left on fender).
 - Remove pump fuse.
 - Visual check of pump fuse
 - Make auxiliary lead (1.5 mm dia. lead and 6.3 mm blade terminal on each end)
 - Connect auxiliary lead between fuse no. 30 and fuse no. 29.
 - In-tank electric fuel pump and pre-supply pump should operate. If so → replace pump fuse. Check pump connection. If not → check connection leads.
- Check connections of in-tank electric fuel pump for good contact. Ground connection (in luggage compartment on central ground point in the middle underneath a cover, near rear panel). Restore components to original state as installed.
- Check voltage directly at in-tank electric fuel pump. (While engine is running)
Set value min. 12 V
In-tank electric fuel pump despite voltage not running? →
Replace in-tank electric fuel pump.

yes

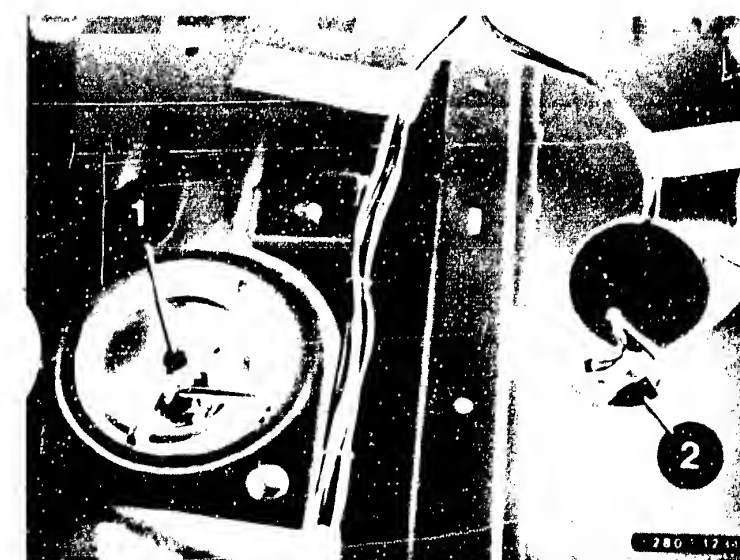
Continued on F14/F15

Continued on F10/F11



Arrow = Pump fuse

1 = In-tank electric fuel pump and pre-supply pump
2 = Tank sensor



F8

Fuel pressure test
SAAB 900 Turbo USA



F9

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

In-tank electric fuel pump removal and installation

- Removal
 - Disconnect battery ground lead.
 - Remove floor panel and cover in luggage compartment. Remove round cover plate over in-tank electric fuel pump.
 - Remove electric connections from electric fuel pump.
 - Unscrew nut, counter-holding on electric fuel pump with SW 17 open-end wrench. Remove fuel line inlet union (middle illustration).

Careful!

When unscrewing fuel pressure line, make sure that no fuel can run out. Take appropriate measures (carefully disconnect fuel pressure line).

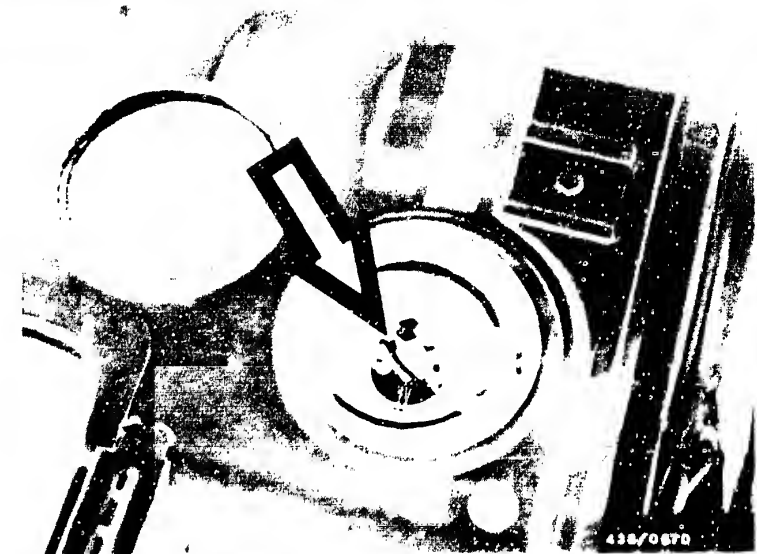
Fire hazard!

- Loosen clamp on in-tank electric fuel pump with a flexible screwdriver (through assembly opening) (lower illustration).

yes

Continued on F14/F15

Continued on F12/F13



F10

Fuel pressure test
SAAB 900 Turbo USA



F11

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

- Remove clamp (8) on sealing collar (9).
- Lift out in-tank electric fuel pump (1) with pre-supply pump (2).
- Remove fuel return line (5) from reservoir.
- Loosen pre-supply pump electric leads on tank lead-through.
- Pull electric fuel pump out of reservoir (6) and remove strainer (7).
- Unscrew clamp (8) on sealing collar (9) and pull electric fuel pump out of the collar.

● Installation

Assemble the in-tank electric fuel pump with the mounting in such a way that the height between the upper edge of the sealing collar and the upper edge of the pump is between 47 ... 53 mm.

Change O-ring (3) and install the sealing collar and electric fuel pump unit in reservoir.

Make sure of correct installation position of electric fuel pump (45° to direction of travel - see lower figure).

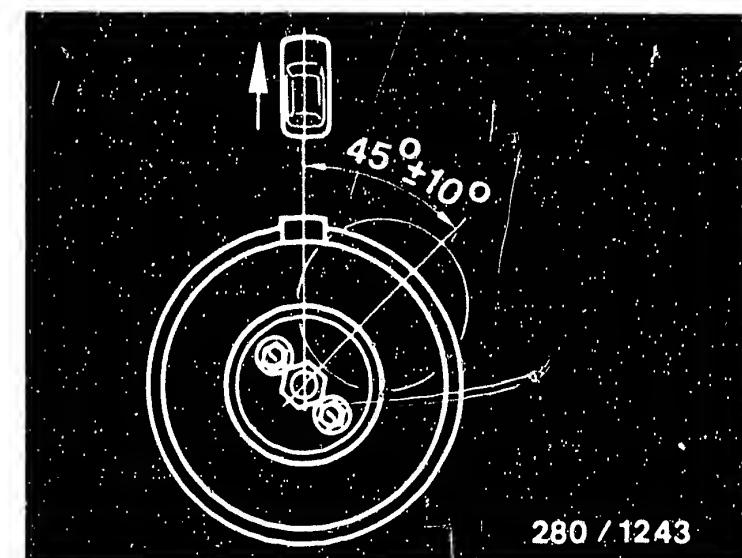
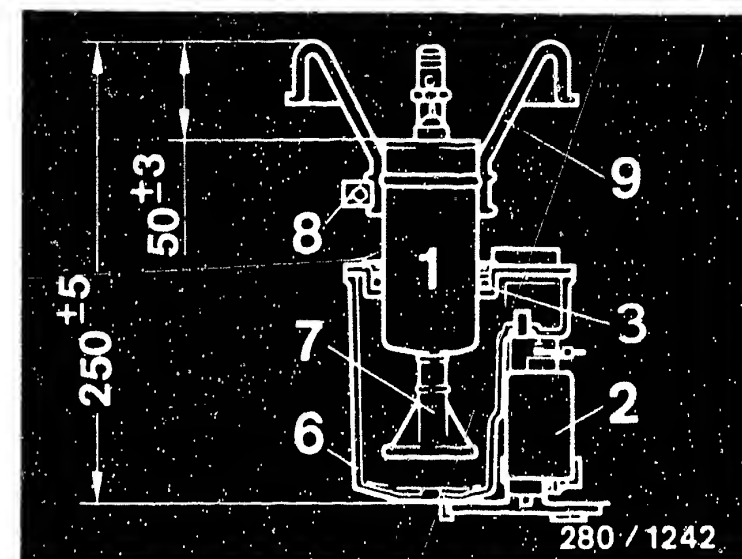
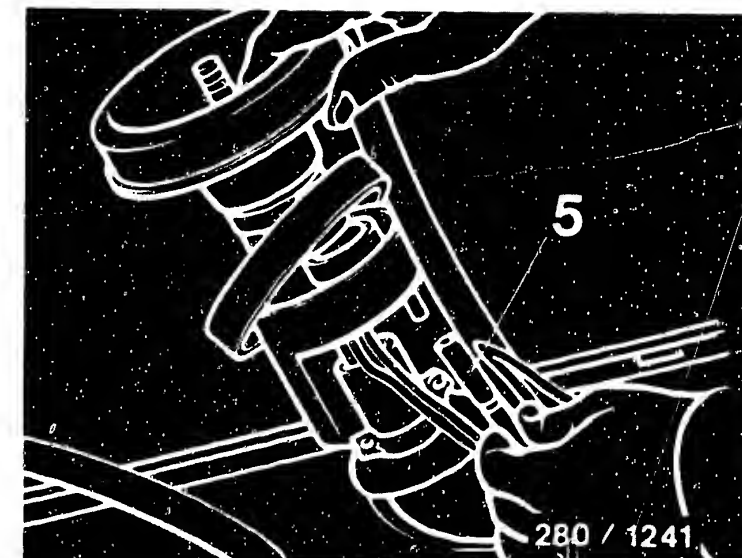
Adjust overall dimension to 245 ... 255 mm. Connect fuel return line and electrical connections (pre-supply pump, electric fuel pump).

Remaining installation occurs in reverse order.

After testing and repair the components must be restored to their original installed state.

yes

Continued on F14/F15



F12

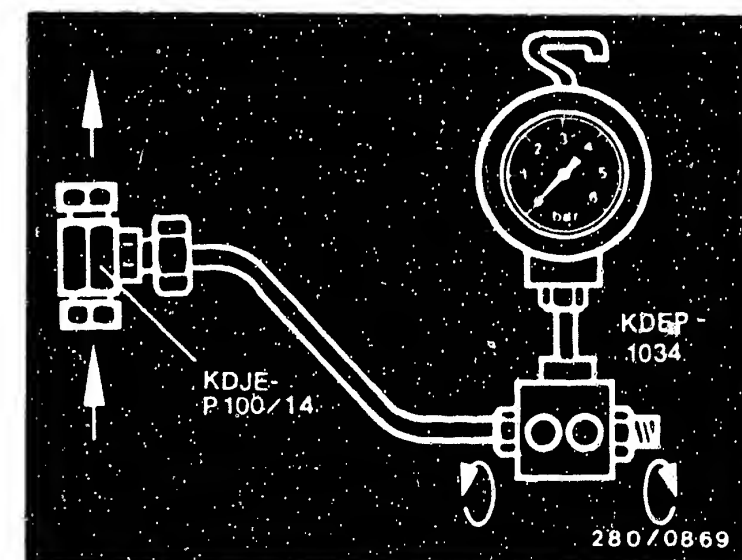
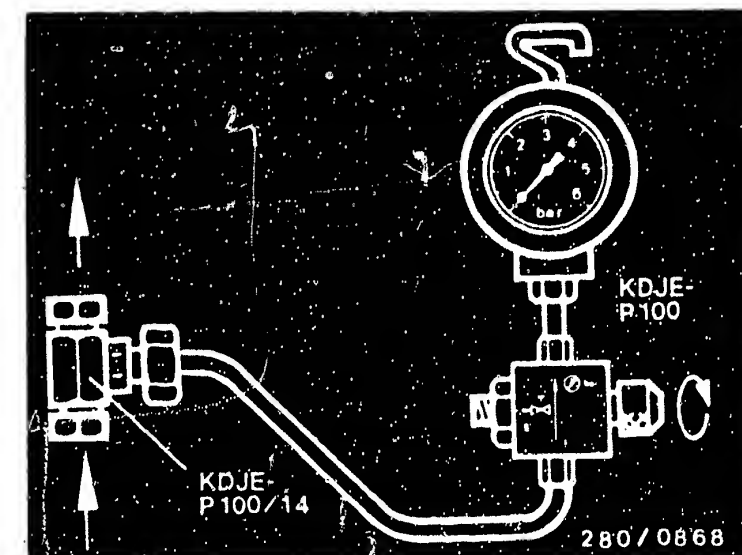
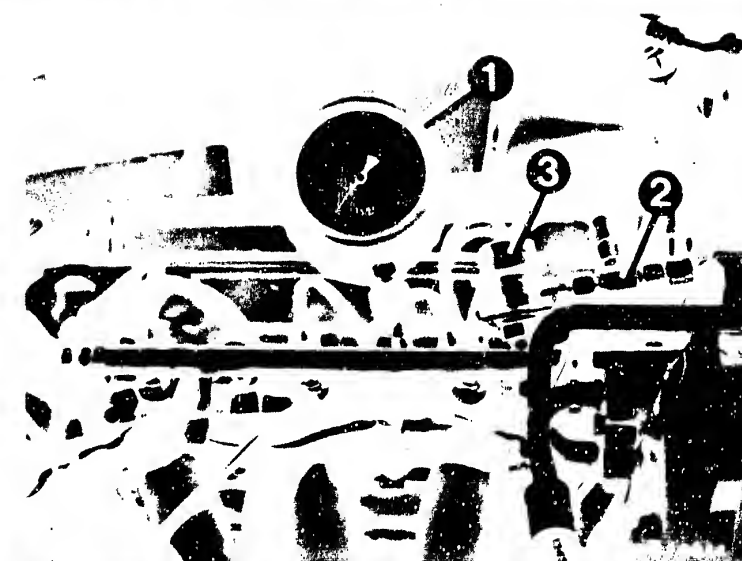
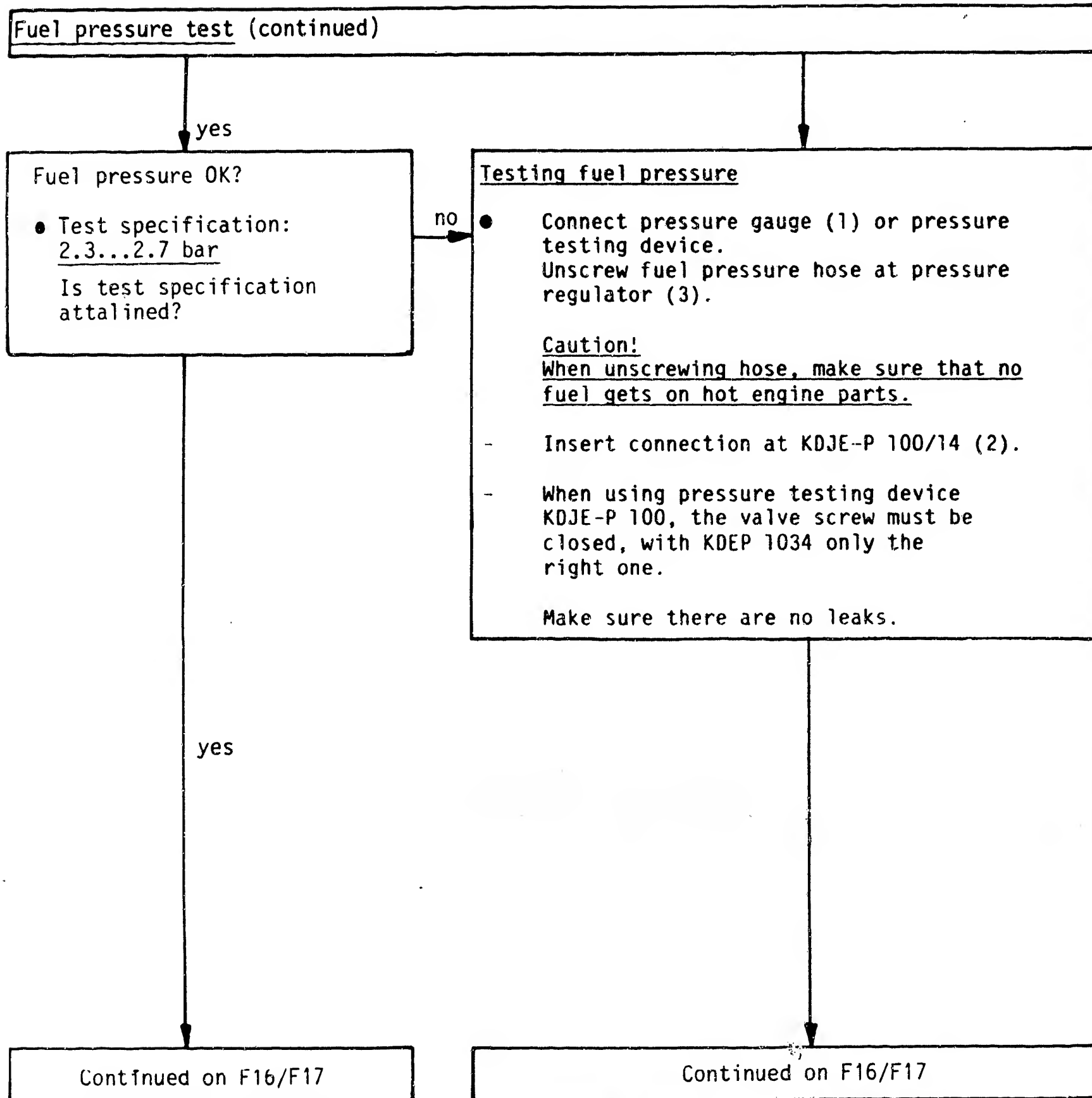
Fuel pressure test
SAAB 900 Turbo USA



F13

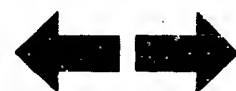
Fuel pressure test
SAAB 900 Turbo USA





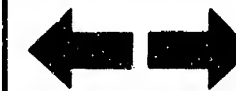
F14

Fuel pressure test
SAAB 900 Turbo USA



F15

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

yes

- Bridging safety circuit
 - Remove pump fuse no. 30.
 - Make auxiliary lead (1.5 mm dia. lead with a 6.3 mm blade terminal at each end.
 - Connect auxiliary lead between fuse no. 30 and no. 29.
 - Read fuel pressure on pressure gauge.

- Fuel pressure
 - Test specification 2.3...2.7 bar

Remove auxiliary lead and correctly re-insert pump fuse.

- Start engine and let run.
 - Fuel pressure goes back to approx. 2.0 bar (depending on intake manifold pressure).

If not → check pressure regulator.

Fuel pressure OK?
Pressure regulator OK?
Test specification:
2.3...2.7 bar
Is test specification attained?

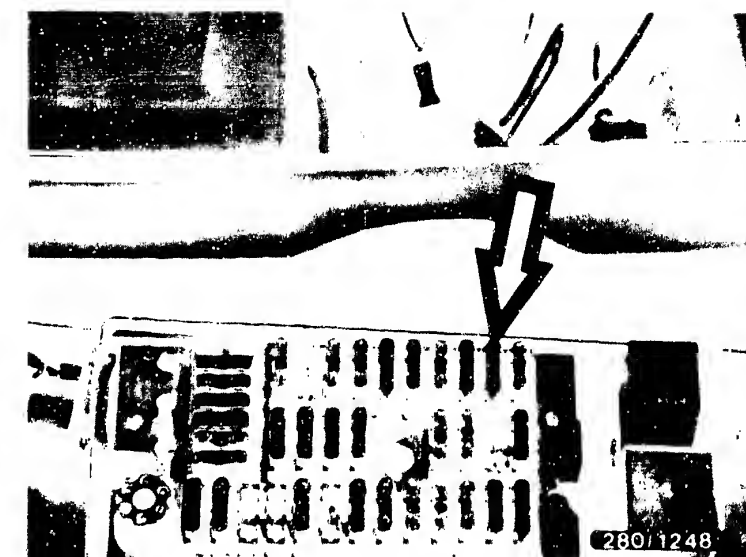
no

- Check test regulator.
 - Start engine and let run.
 - Fuel pressure test specification: approx. 2.0 bar
 - Remove vacuum hose from pressure regulator.
 - Fuel pressure test value 2.3...2.7 bar

yes

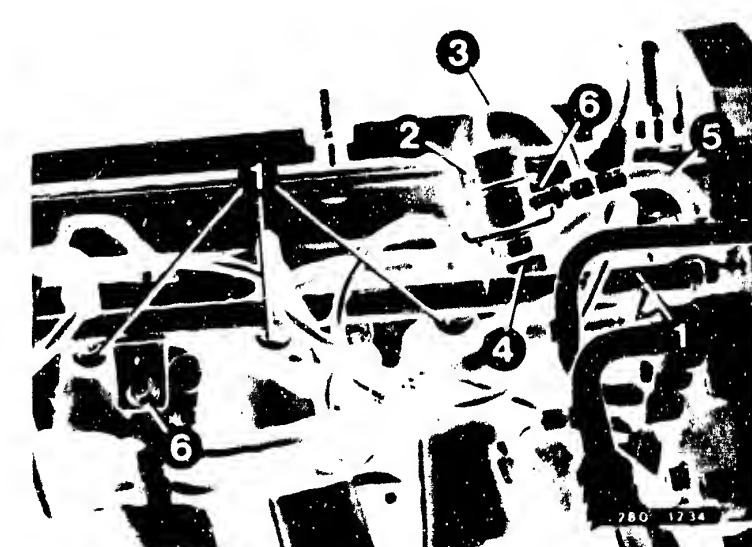
Continued on G1/G2

Continued on F18/F19



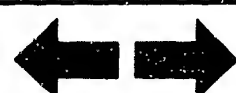
Arrow = Pump fuse

2 = Pressure regulator
3 = Intake manifold connection (Vacuum hose)



F16

Fuel pressure test
SAAB 900 Turbo USA



F17

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

yes

Fuel pressure of 2.3 bar is not attained:

- Slowly pinch off fuel return line.

Caution!

Do not load pressure gauge above 6 bar!

If pressure rises above 4 bar →
replace pressure regulator.
The pressure regulator is mounted on a
bracket on the fuel-distribution pipe

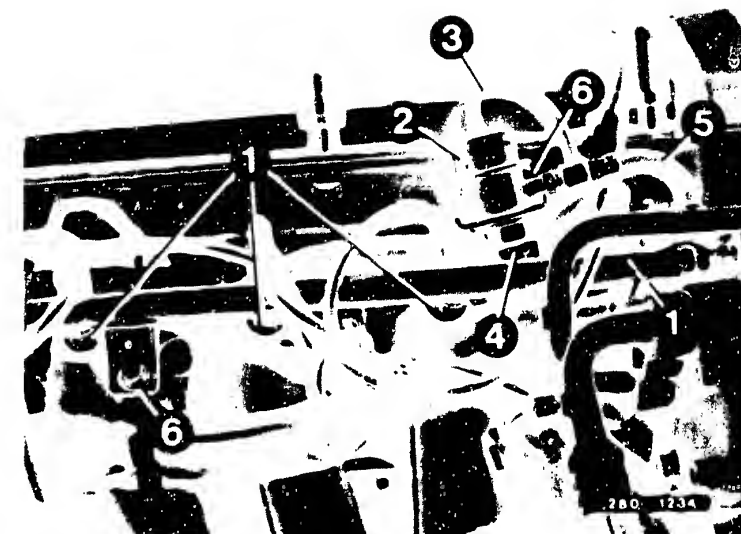
- Fuel pressure line, fuel filter
(underneath vehicle near tank) clogged.
Make sure of correct installation
direction.

- Strainer in tank clogged.
Corrosion in tank.

- In-tank electric fuel pump defective.

Fuel pressure of 2.7 bar is exceeded:

- Fuel return line (4) clogged or pinched
off.
- Replace fuel regulator (2).



2 = Pressure regulator
4 = Fuel return line

Continued on G1/G2

Continued on F20/F21

F18

Fuel pressure test
SAAB 900 Turbo USA



F19

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

In-tank electric fuel pump removal and installation

● Removal

- Disconnect battery ground lead.
- Remove floor panel and cover in luggage compartment. Remove round cover plate over in-tank electric fuel pump.
- Remove electric connections from electric fuel pump.
- Unscrew nut, counter-holding on electric fuel pump with SW 17 open-end wrench. Remove fuel line inlet union (middle illustration).

Careful!

When unscrewing fuel pressure line, make sure that no fuel can run out. Take appropriate measures (carefully disconnect fuel pressure line).

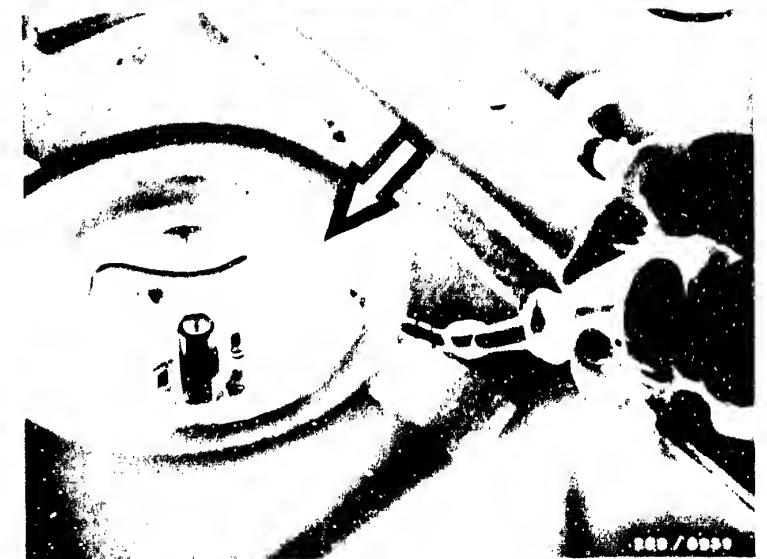
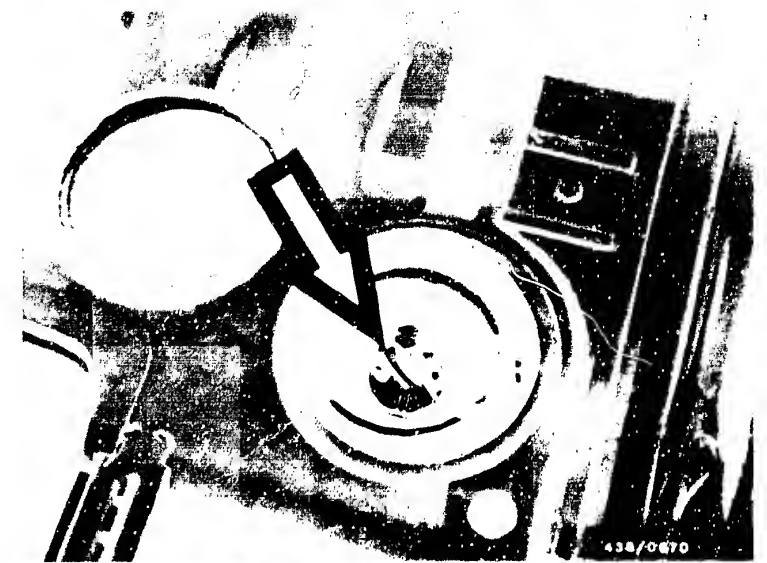
Fire hazard!

- Loosen clamp on in-tank electric fuel pump with a flexible screwdriver (through assembly opening) (lower illustration).

yes

Continued on G1/G2

Continued on F22/F23



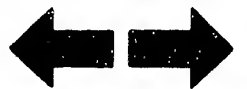
F20

Fuel pressure test
SAAB 900 Turbo USA



F21

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

yes

Continued on G1/G2

- Remove clamp (8) on sealing collar (9).
- Lift out in-tank electric fuel pump (1) with pre-supply pump (2).
- Remove fuel return line (5) from reservoir.
- Loosen pre-supply pump electric leads on tank lead-through.
- Pull electric fuel pump out of reservoir (6) and remove strainer (7).
- Unscrew clamp (8) on sealing collar (9) and pull electric fuel pump out of the collar.

● Installation

Assemble the in-tank electric fuel pump with the mounting in such a way that the height between the upper edge of the sealing collar and the upper edge of the pump is between 47 ... 53 mm.

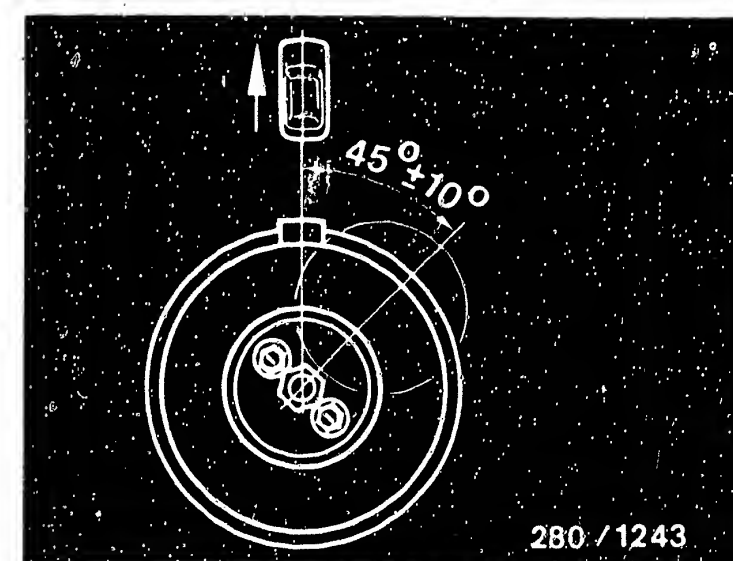
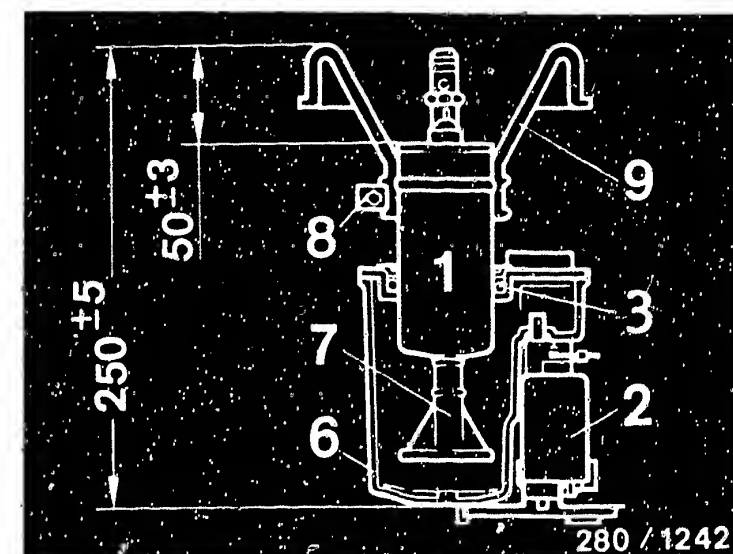
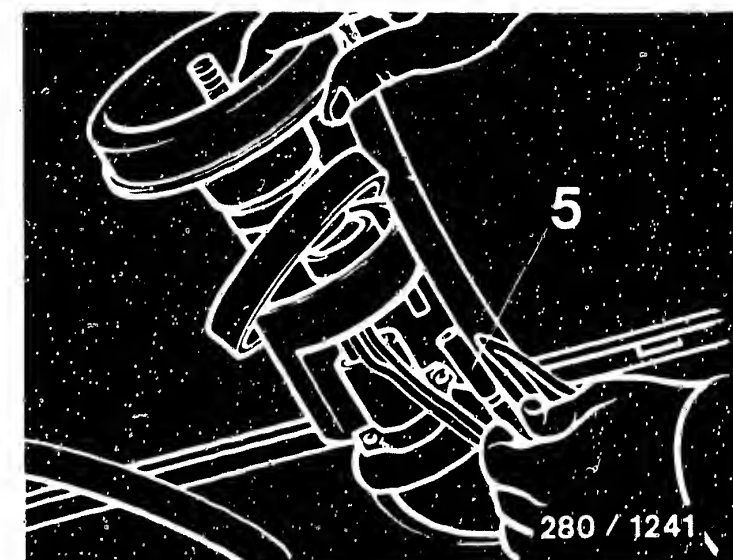
Change O-ring (3) and install the sealing collar and electric fuel pump unit in reservoir.

Make sure of correct installation position of electric fuel pump (45° to direction of travel - see lower figure).

Adjust overall dimension to 245 ... 255 mm. Connect fuel return line and electrical connections (pre-supply pump, electric fuel pump).

Remaining installation occurs in reverse order.

After testing and repair the components must be restored to their original installed state.



F22

Fuel pressure test
SAAB 900 Turbo USA



F23

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

yes

Does fuel pressure remain almost constant after turning off engine?

Test specification:
2.3...2.7 bar

Is test specification attained?

no

Fuel pressure quickly declines after turning off hot engine.

- Check fuel system for leaks (build up fuel pressure):
- Bridge safety circuit
- Remove pump fuse no. 30
- Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal on each end)
- Connect auxiliary lead between fuse no. 30 and no. 29.
- Read fuel pressure on pressure gauge.
Fuel pressure 2.3...2.7 bar

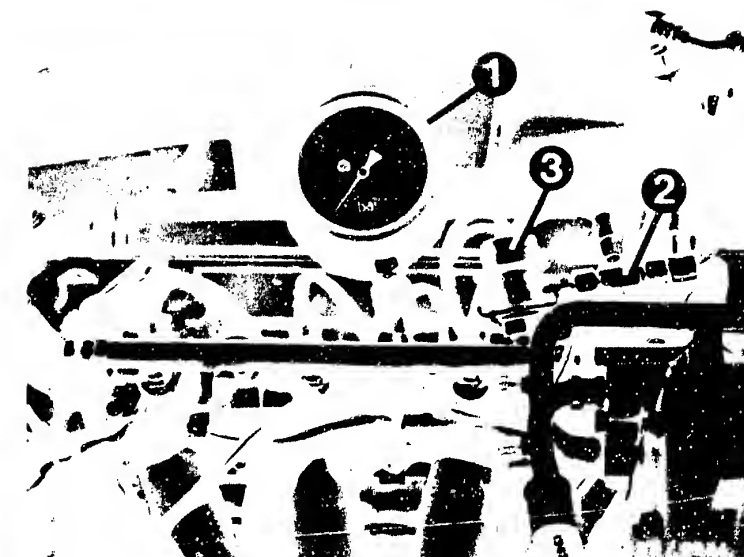
Remove auxiliary lead and observe pressure gauge.
After approx. 20 min. fuel pressure must still be at least 1.0 bar.

If not:

- Check connection points between components and fuel hoses and lines for leaks.
 - Pressure regulator (diaphragm).
 - Solenoid-operated injection valves (needle seating, valves close incorrectly).
 - Fuel filter leakage. (Underneath vehicle near tank)
 - Electric fuel pump (leaking non-return valve)
- Use parts set 1 587 010 006.

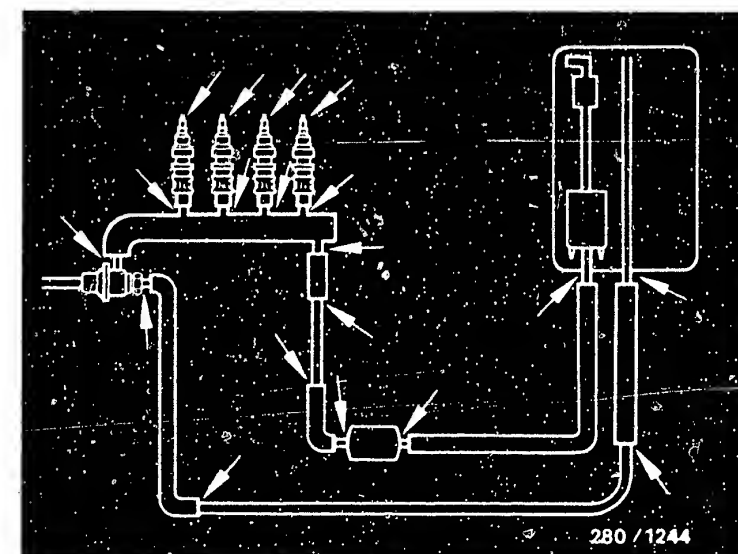
yes

Continued on G3/G4



1 = Pressure graph
3 = Pressure regulator

Fuel line diagram
Arrows show connection points of hoses with components.



G1

Fuel pressure test
SAAB 900 Turbo USA



G2

Fuel pressure test
SAAB 900 Turbo USA



Fuel pressure test (continued)

yes

Does in-tank electric fuel pump non-return valve leak?

no

yes

Remove pressure gauge.
Restore connection between fuel pressure line and fuel-distribution pipe.
Remove lead bridge and auxiliary lead, and reconnect plug connection.

Careful!

After testing, restore original installed state.

Fuel pressure testing is concluded.

If the fault was not found, or further instructions for repair are necessary, proceed per the trouble-shooting program you have selected.

Detailed trouble-shooting program (coordinates C3/C4)

Direct trouble-shooting program (coordinates C5...C8).

● Removing non-return valve

- Disconnect battery ground lead.
- Lift out floor panel and cover in luggage compartment. Remove covering over in-tank electric fuel pump.
- Remove lead connections on in-tank electric fuel pump.
- Unscrew nut, counter-holding in-tank electric fuel pump with a SW 17 open-end wrench. Remove fuel line inlet union (middle illustration).

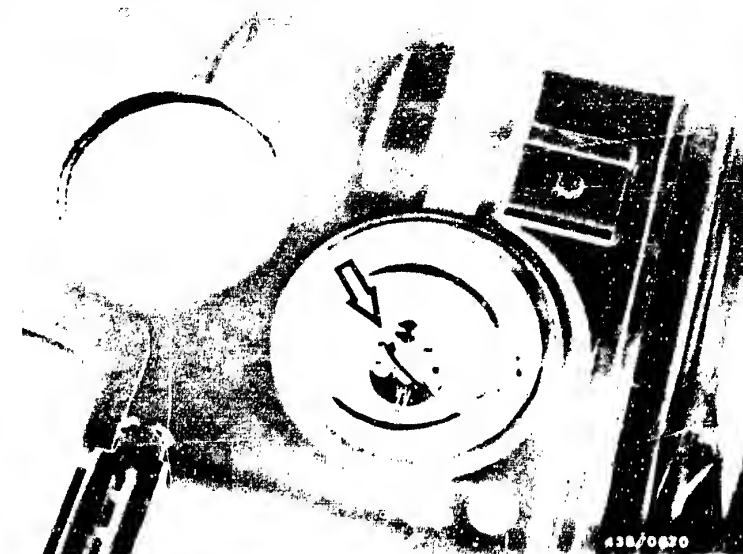
Caution!

When unscrewing fuel pressure line, ensure that no fuel can run out. Take appropriate measures (carefully pinch off fuel pressure line).

- Loosen inlet union and built-in non-return valve (lower illustration - arrow) (1 587 010 006)
- Counter-hold in-tank electric fuel pump with an open-end wrench.

- Installation is in reverse order.

Tightening torque for non-return valve:
10...16 Nm



G3

Fuel pressure test
SAAB 900 Turbo USA



G4

Fuel pressure test
SAAB 900 Turbo USA



STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS POORLY

Trouble-shooting program according to customer complaint

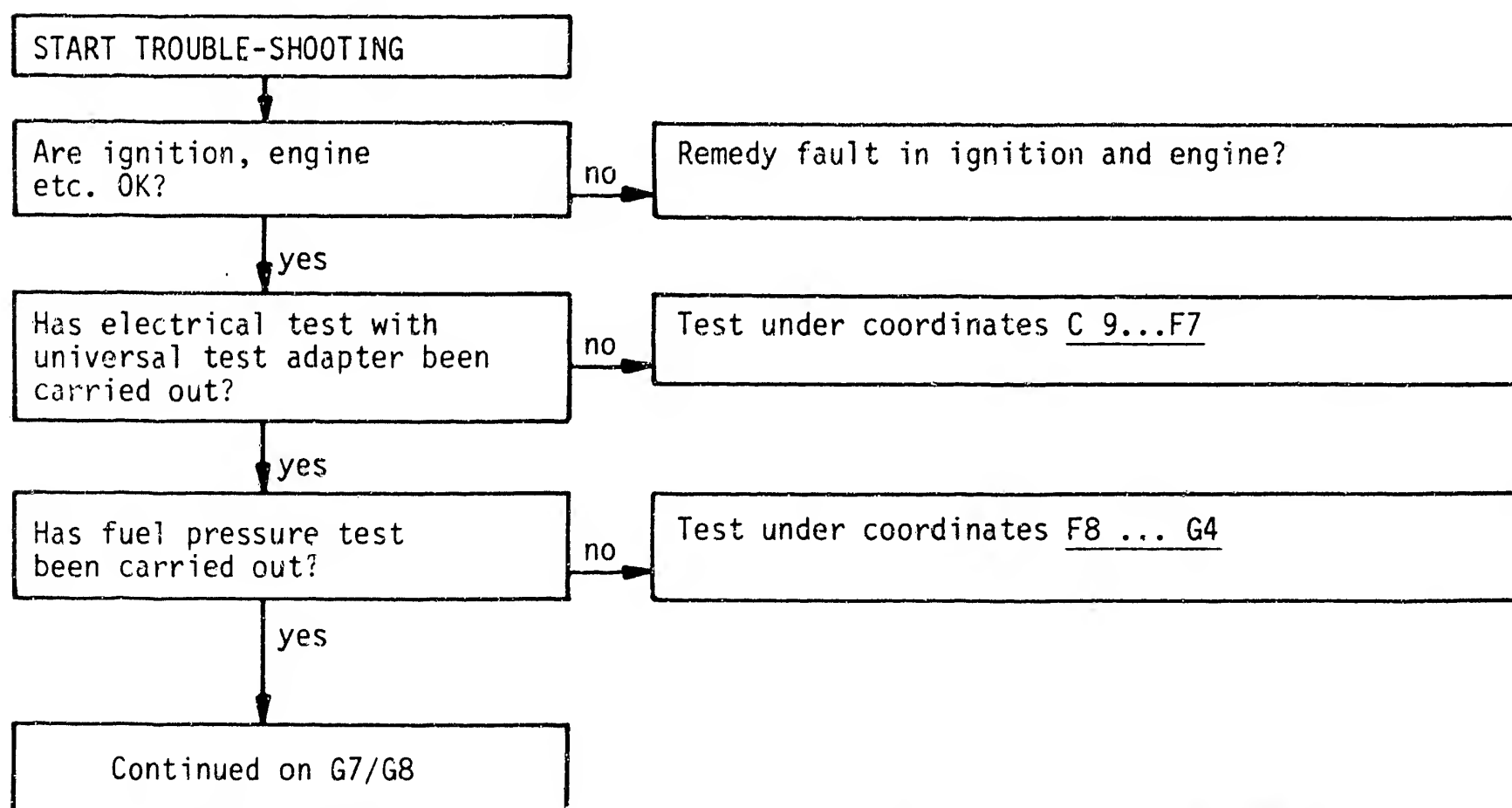
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



G5

Engine fails to start
SAAB 900 Turbo USA



G6

Engine fails to start
SAAB 900 Turbo USA



Starting motor operates, engine fails to start or starts poorly (continued)

yes

Start control OK?
(Control unit function)

- Connect test lead between a solenoid-operated injection valve
- Remove plug from temperature sensor 2 to engine. (Blue plug)
- Connect motortester or multimeter to test lead (position V, measuring range 10 V).
- Remove pump fuse no. 30.
- Apply ignition lead term. 4 from ignition distributor to ground via a spark gap.

Start engine.
Does voltage at solenoid-operated injection valve fall from initial of greater than 2 V to approx. 0.5 V during starting?
(if engine is at operating temperature or NTC II plug is plugged in, voltage is less than 0.5 V).

After testing restore to original installed state.

yes

Continued on G11/G12

no

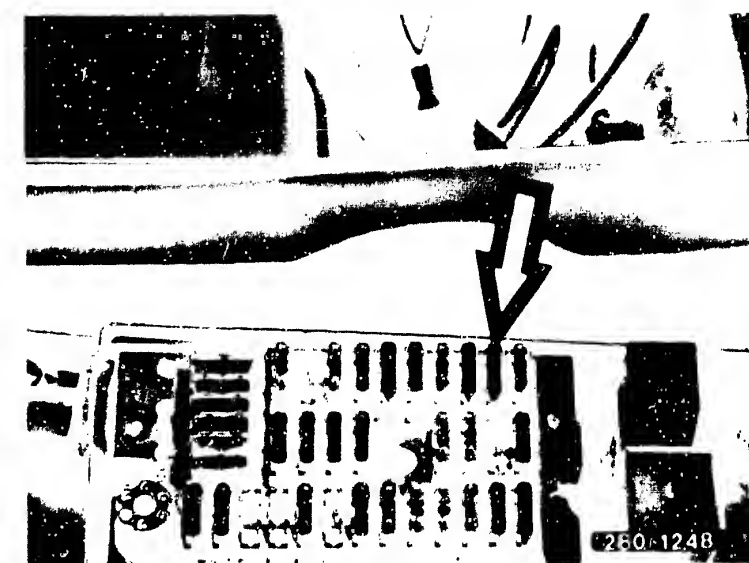
Functional test

- Remove pump fuse no. 30 (in central fuse box on left fender).
- Remove ignition lead term. 4 from ignition distributor cap and connect to vehicle ground with spark gap. (Careful! Engine must not start).

Careful!

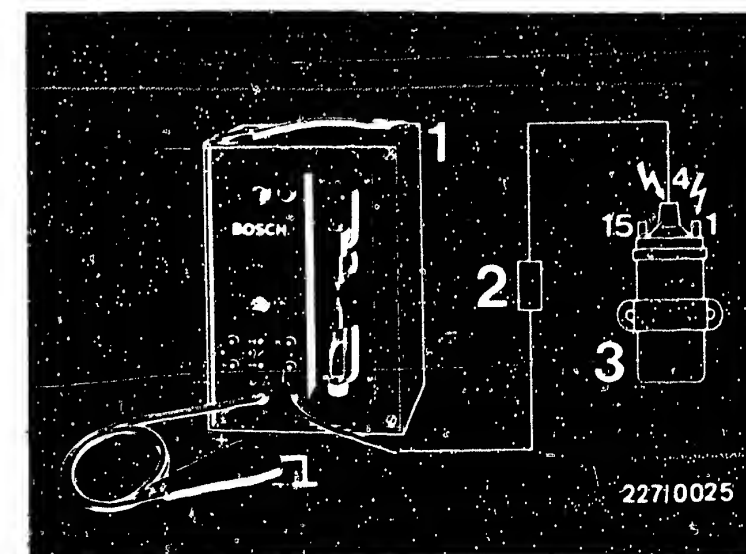
When using a spark gap EF 1177/7 1 684 531 000, an interference-suppression resistor of at least 2 k Ω , e.g. sleeve-type suppressor (5 k Ω) 0 356 500 001, must be connected between spark gap and ignition coil term. 4, in order to prevent destruction of the control unit.

Continued on G9/G10



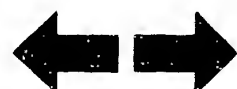
Arrow = Pump fuse

- 1 = Ignition coil condensor tester
EFAW 106 A
0 681 100 001
2 = Sleeve-type suppressor 5k Ω
3 = Ignition coil
Caution!
Hazardous voltages
400 V - 25 kV
at term. 1 and term. 4



G7

Engine fails to start
SAAB 900 Turbo USA



G8

Engine fails to start
SAAB 900 Turbo USA



Starting motor operates, engine fails to start or starts poorly (continued)

yes

- Connect 2-pin adapter lead 1 684 463 093 between a solenoid-operated injection valve and its electrical connection lead.
- Connect multimeter or motortester to free measuring pin. Measuring range approx. 10 V.
- Pull cable plug from temperature sensor II (engine) (blue plug).

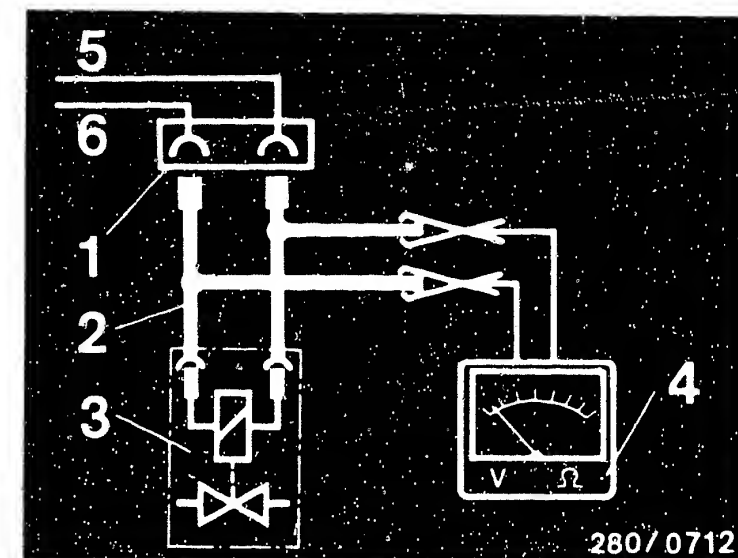
Measurement:

- Start engine
- Voltage reading falls from initial of greater than 2V within approx. 15 sec start time to approx. 0.5 V.
If voltage not attained → replace control unit.
- Voltage test can be repeated only after approx. 1 min.
- Plug cable plug to temperature sensor.
If engine at operating temperature, start → voltage reading less than 0.5 V.
If not → replace temperature sensor II.

Careful!

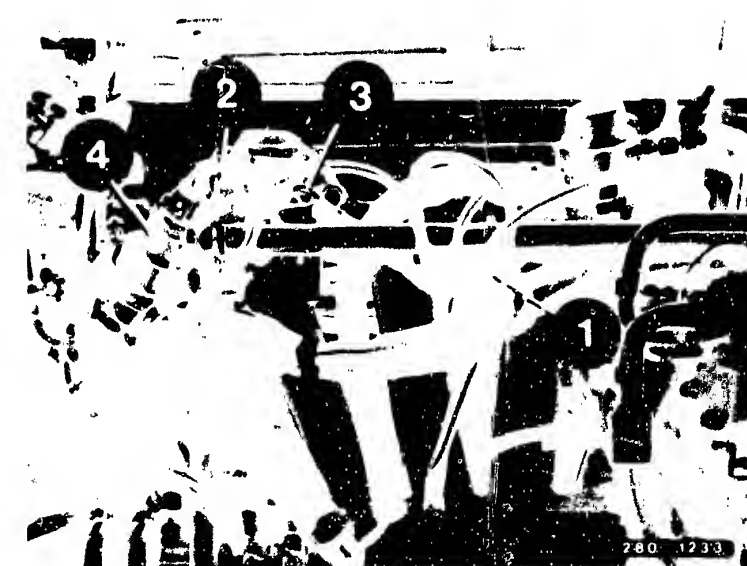
After testing, restore to original installed state.

Continued on G11/G12



- 1 = Solenoid-operated injection valve lead connection plug
- 2 = Test lead 1 684 463 093
- 3 = Injection valve
- 4 = Multimeter or motortester
- 5 = From pump relay term. 87
- 6 = From control unit term. 13

- 1 = Temperature sensor II (Engine) on engine block (blue plug)



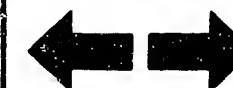
G9

Engine fails to start
SAAB 900 Turbo USA



G10

Engine fails to start
SAAB 900 Turbo USA



Starting motor operates, engine fails to start or starts poorly (continued)

yes

Idle actuator in good mechanical condition?

no

- Idle actuator is tested electrically and for functioning with the universal test adapter.
- Mechanical test
Idle actuator is tested for freedom of movement as follows:
 - Remove idle actuator (pull off hoses).
 - Remove plug.
 - Connect middle connection (term. 2) to battery voltage.
 - Connect outer connection (term. 1) to ground.
 - Ascertain by visual check whether rotary spool turns to end stop.
 - Change outer connection, i.e. connect term. 3 to ground. Rotary spool must now turn to opposite stop.
- Exchange defective idle actuator.
- When installing idle actuator observe flow-through direction (arrow).

yes

Hot start.

When starting with fully-depressed gas pedal (full-load contact closed), does engine not start?

no

When starting, fuel delivery is switched off when accelerator pedal is pressed down to full-throttle position.
Improving hot-starting performance:

Depress accelerator pedal only about half way (full-load contact must not close!) and start.

yes

Continued on G13/G14



4 = Idle actuator

G11

Engine fails to start
SAAB 900 Turbo USA



G12

Engine fails to start
SAAB 900 Turbo USA



Starting motor operates, engine fails to start or starts poorly (continued)

Are all hose connections and electricals firmly connected? Visual check. Has induction system been checked for leaks.

yes

yes

Customer complaint test

"Starting motor operates, engine fails to start or starts poorly"

concluded.
Has customer complaint been remedied?

no

no

Check whether hoses of induction system and fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Correct leakage with new seals or by tightening connection screws.

Leakage inspection

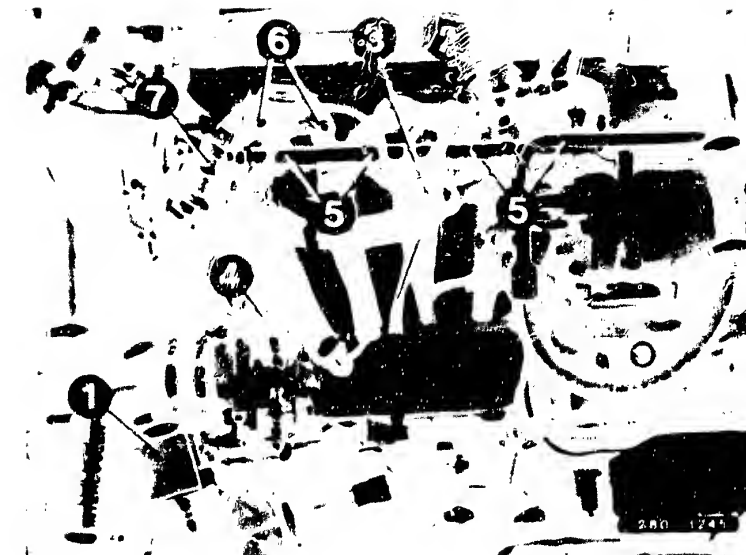
Seal off exhaust tail pipe, unscrew hose from air filter to air-mass sensor at air-mass sensor and seal off air-mass sensor duct (dust cover). Pull off hose after idle actuator. Seal off idle actuator connection. Blow air into hose to intake manifold using compressed-air gun (0.3 bar). Meanwhile, fully open throttle valve. Spray or brush on soapy water onto all sealing points. Bubble or foam formation indicates leakage.

Careful!

Reconnect all hoses and firmly tighten hose clamps. Check sealing.

Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the failure was not diagnosed with "direct trouble-shooting", see "detailed trouble-shooting" (coordinates C3/C4).
- Engine not in good mechanical order, (compression, valve setting, valve timing, worn camshaft).



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Injection valves
- 6 = Ground terminals
- 7 = Idle actuator

G13

Engine fails to start
SAAB 900 Turbo USA



G14

Engine fails to start
SAAB 900 Turbo USA



ENGINE STARTS BUT THEN DIES

Trouble-shooting program according to customer complaint

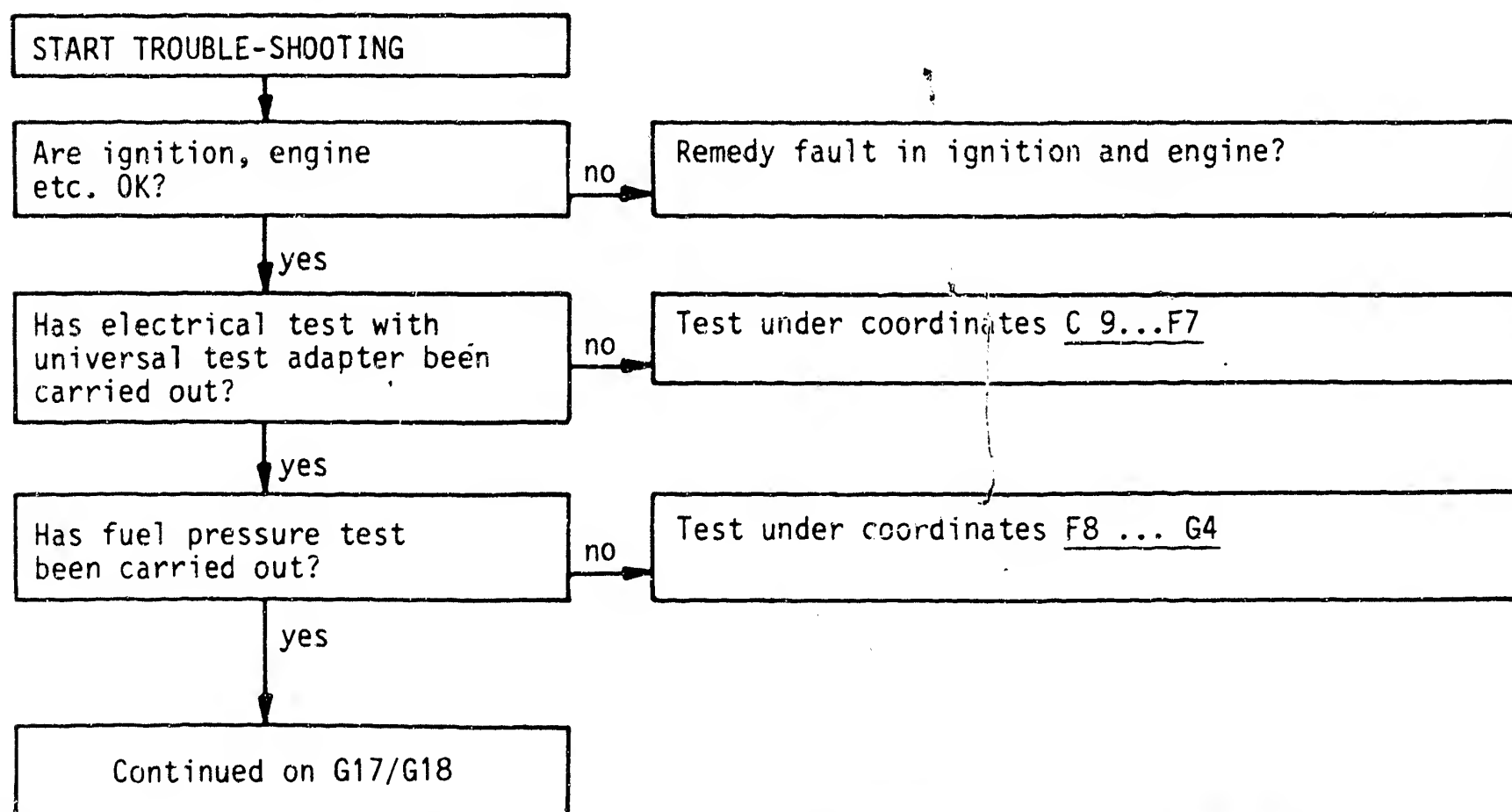
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



G 15

Engine starts but then dies
SAAB 900 Turbo USA



G 16

Engine starts but then dies
SAAB 900 Turbo USA



Engine starts but then dies (continued)

yes

Idle actuator in good mechanical condition?

no

yes

- Idle actuator is tested electrically and for functioning with the universal test adapter.
- Mechanical test
Idle actuator is tested for freedom of movement as follows:
 - Remove idle actuator (pull off hoses).
 - Remove plug.
 - Connect middle connection (term. 2) to battery voltage.
 - Connect outer connection (term. 1) to ground.
 - Ascertain by visual check whether rotary spool turns to end stop.
 - Change outer connection, i.e. connect term. 3 to ground. Rotary spool must now turn to opposite stop.Exchange defective idle actuator.
When installing idle actuator observe flow-through direction (arrow).

Continued on G19/G20



4 = Idle actuator

G17

Engine starts but then dies
SAAB 900 Turbo USA



G18

Engine starts but then dies
SAAB 900 Turbo USA



Engine starts but then dies (continued)

yes

Solenoid-operated injection
valve sealing OK?

no

yes

Continued on G23/G24

Checking sealing of solenoid-operated
injection valves:

- Remove fuel-distribution pipe with injection valve:
 - Loosen fastening screws on fuel-distributuion pipe and pressure regulator.
 - Pull all 4 injection valves out of the cylinder head simultaneously and carefully.
- Build up fuel pressure:
 - Bridge safety circuit
 - Pull out pump fuse no. 30.
 - Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal at each end)
 - Connect auxiliary lead between fuses no. 30 and no. 29.
 - In-tank electric fuel pump should operate.

Test specification:

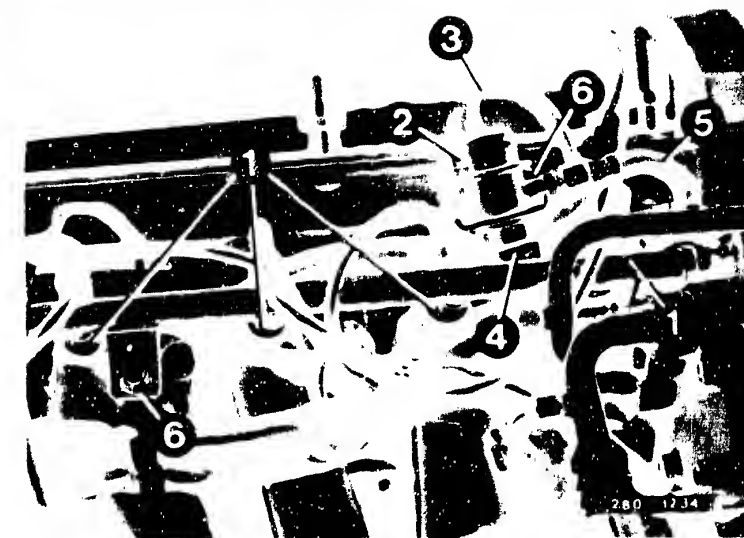
Witnin 60 sec. there must be no drop formation at the mouth of the solenoid-operated injection valve. In case of fault, exchange injection valve.

● Removal

- Remove electrical connection.
- Carefully push holding clamp out of groove.
- Carefully pull injection valve out of fuel-distribution pipe.

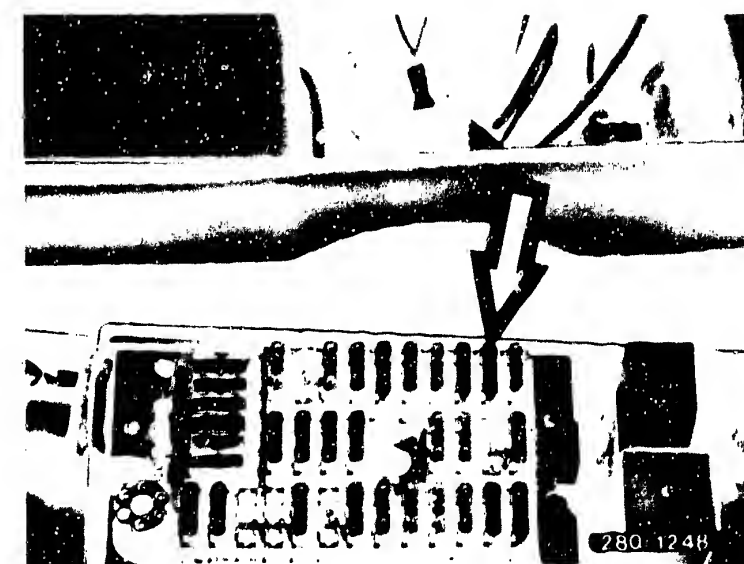
Caution! Catch any fuel running out. Do not allow to drop onto hot engine parts.

Continued on G21/G22



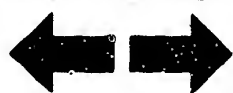
1 = Injection valves
6 = Fastening screws

Arrow = Pump fuse



G 19

Engine starts but then dies
SAAB 900 Turbo USA



G 20

Engine starts but then dies
SAAB 900 Turbo USA



Engine starts but then dies (continued)

● Installation

Careful!

Before installation, both O-rings may be greased only lightly (silicone grease Ft 2 v 1).

The remaining solenoid-injection valve parts must stay grease-free.

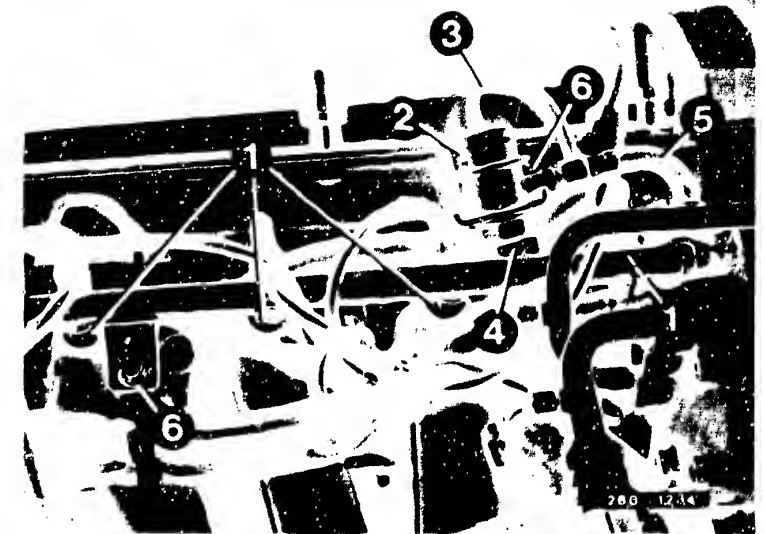
- Carefully plug new solenoid-operated injection valve into fuel-distribution pipe.
- Push holding clamp into groove on injection valve until clamp engages. (Check connection point for leakage).

Note!

After testing, restore to original installed condition. Check for leaks (extraneous air).

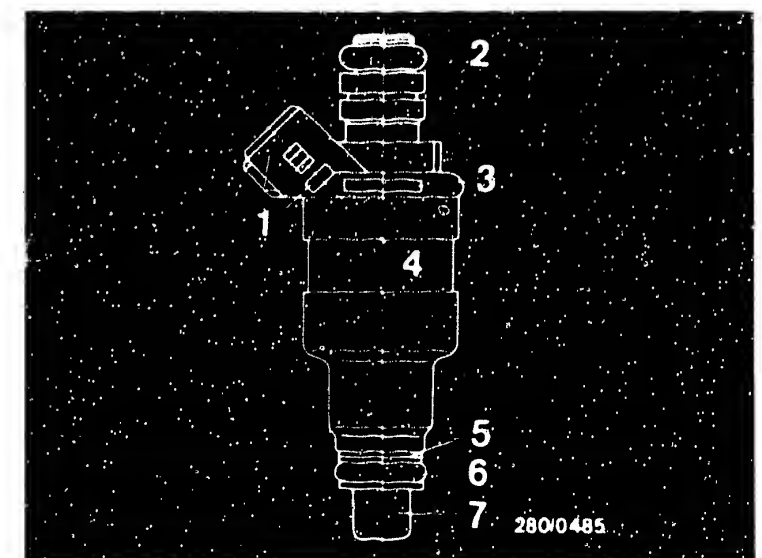
yes

Continued on G23/G24



1 = Solenoid valves
6 = Fastening screws

1 = FD marking
2 = Upper O-ring
3 = Part number
4 = Injection valve
5 = Supporting plate
(yellow 2 mm)
6 = Lower O-ring
7 = Protection sleeve



G21

Engine starts but then dies

SAAB 900 Turbo USA



G22

Engine starts but then dies

SAAB 900 Turbo USA



Engine starts but then dies (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

Electrical test

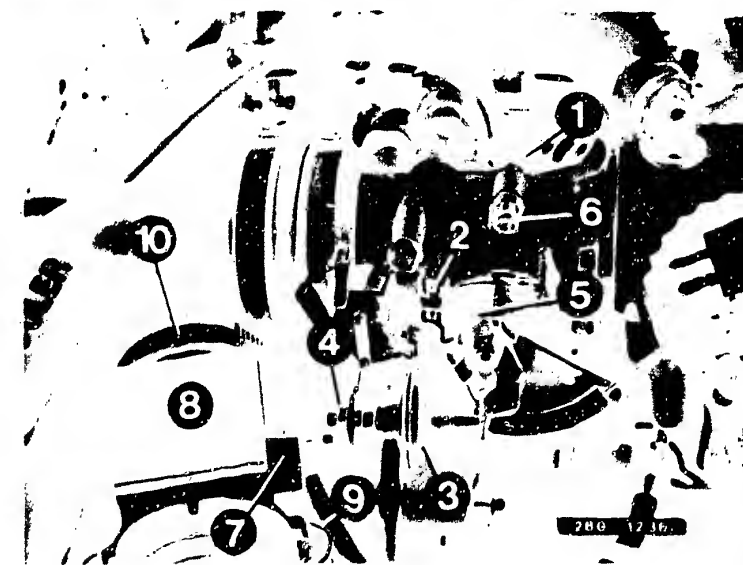
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0...1100 Ω
between term. 5 and term. 3: 3.6...4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

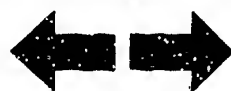
Continued on H1/H2



- 7 = Potentiometer for idle-mixture adjustment
8 = Hot-wire air-mass sensor
9 = Clamp fasteners
10 = Hose bands

G23

Engine starts but then dies
SAAB 900 Turbo USA

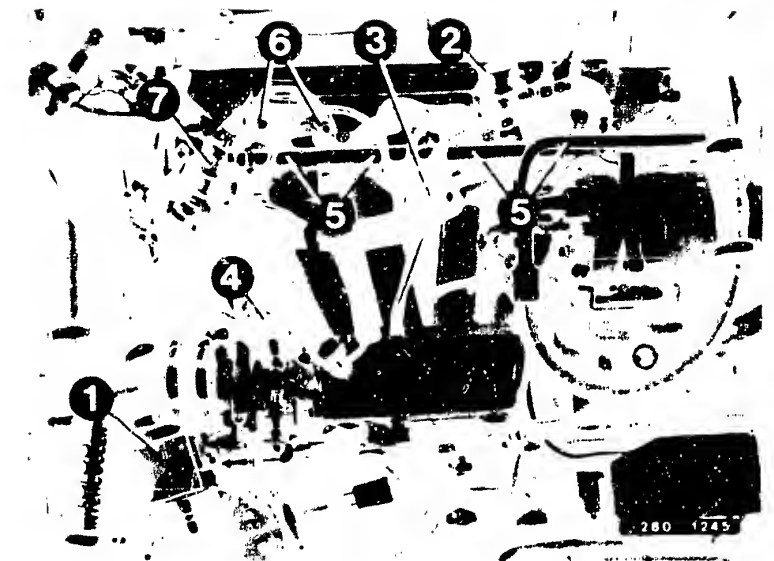
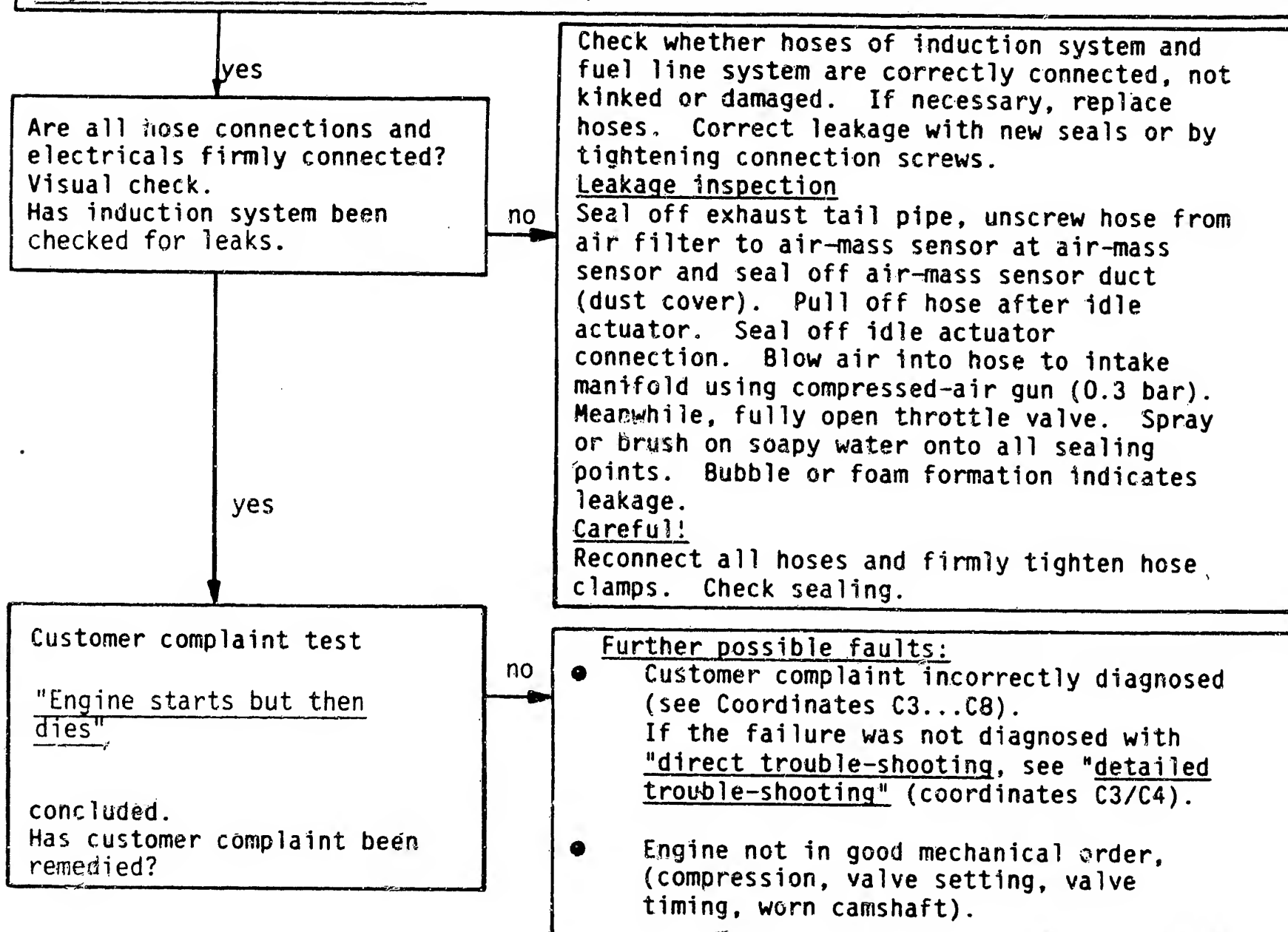


G24

Engine starts but then dies
SAAB 900 Turbo USA



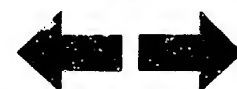
Engine starts but then dies (continued)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Injection valves
- 6 = Ground terminals
- 7 = Idle actuator

H1

Engine starts but then dies
SAAB 900 Turbo USA



H2

Engine starts but then dies
SAAB 900 Turbo USA



UNEVEN IDLE, INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

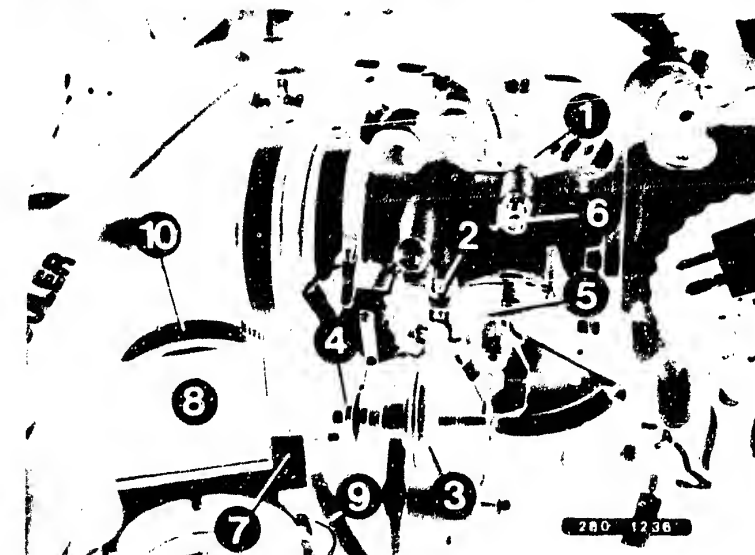
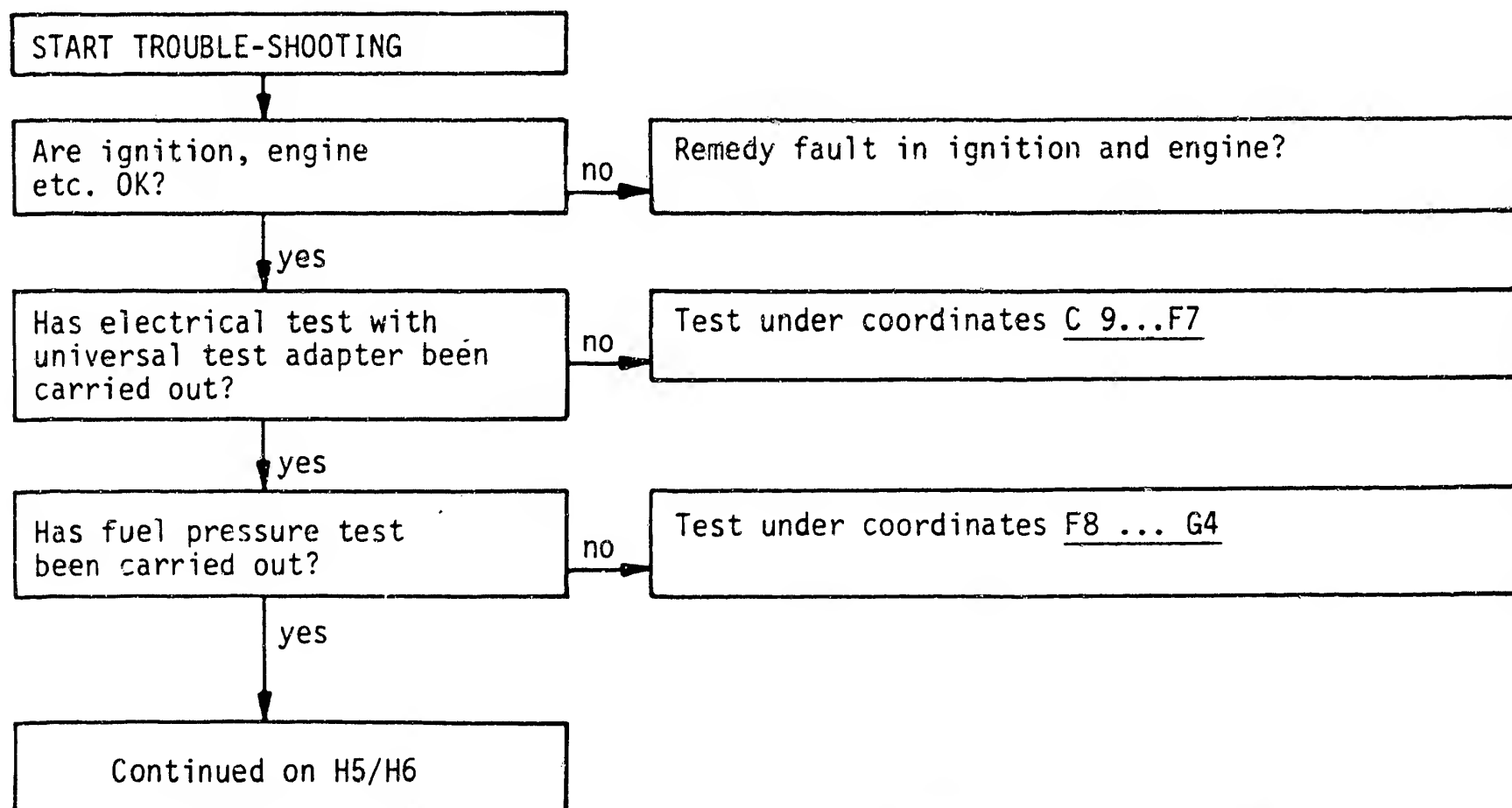
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



H3

Uneven idle

SAAB 900 Turbo USA



H4

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

Is throttle valve closed?

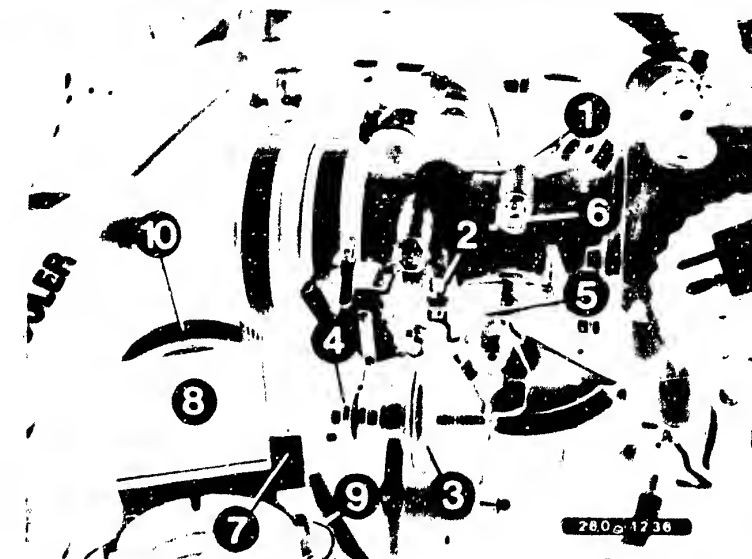
- Does throttle-plate lever hit against stop screw?

no

- Test
Determine whether the throttle valve can be further closed, reducing engine speed.
- Throttle-valve adjustment:
 - Check whether throttle valve is centered in throttle housing.
 - Unscrew stop screw far enough so that there is no contact between stop screw and throttle-plate lever.
 - Screw stop screw in far enough so that stop screw touches throttle-plate lever.
 - Then screw in stop screw 3/4 more turns and lock with locknut.
This results in a play between throttle valve and throttle housing of approx. 0.05 mm.
- Check accelerator cable length
 - Accelerator cable must be at least long enough so that throttle valve is in idle position.
 - No play in accelerator cable.
 - Throttle valve must be fully open when gas pedal is fully depressed.

yes

Continued on H7/H8



- 2 = Throttle-valve stop screw
- 3 = Throttle-valve damper
- 4 = Lock nut, for setting throttle-valve damper
- 5 = Throttle plate lever

H5

Uneven idle

SAAB 900 Turbo USA



H6

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

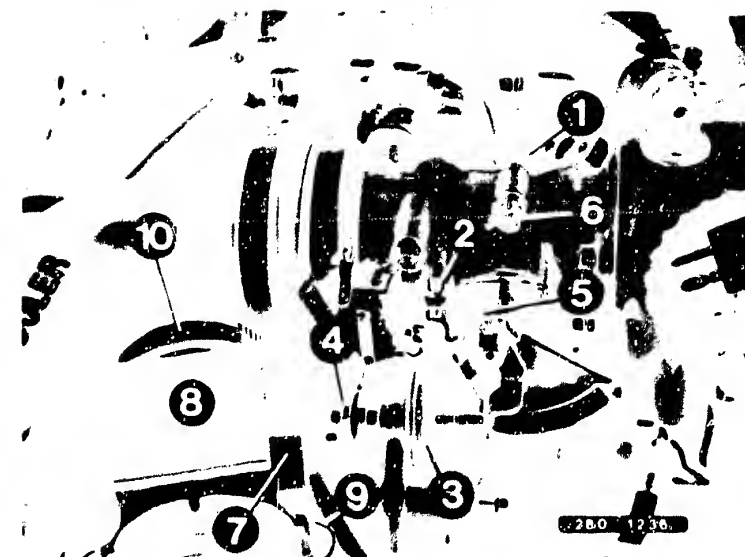
Throttle-valve switch correctly adjusted?
Does idle contact close?
Does microswitch audibly click?
Is accelerator cable free of tension?
Is accelerator cable free of kinks?

no

- Adjusting throttle-valve switch
Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch a bit to the left, and then to the right, until idle contact closes (microswitch audibly clicks). Reading 0 Ω .
- Checking adjustment:
Pull accelerator cable slightly. Idle actuator opens (microswitch clicks audibly). Reading $\infty\Omega$.
Tighten throttle-valve switch again.
If reading incorrect, replace throttle-valve switch.

yes

Continued on H9/H10

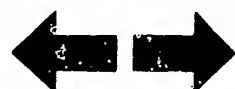


1 = Throttle-valve switch

H7

Uneven idle

SAAB 900 Turbo USA



H8

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

Is mechanical throttle-valve damper OK?

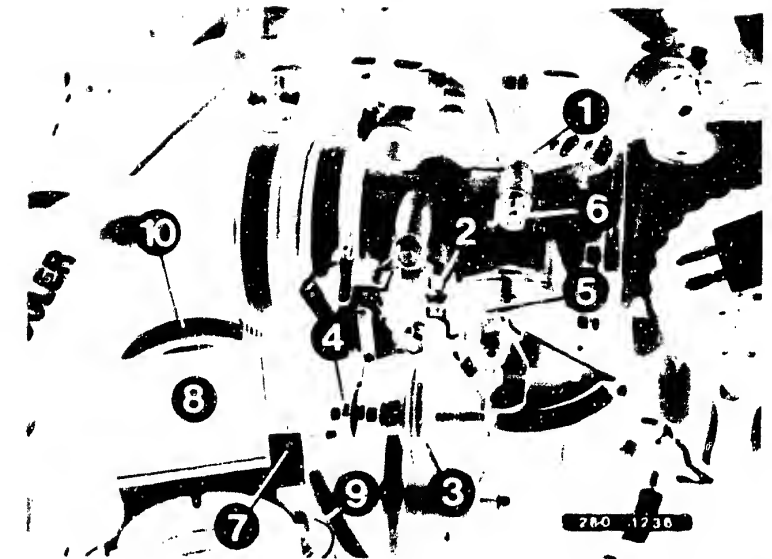
- Testing
- Adjustment

no

- Testing
 - Adjust idle speed to $775...925 \text{ min}^{-1}$ with engine at operating temperature.
 - Increase engine speed to 2000 min^{-1} and measure the time between releasing the gas pedal and attainment of idle speed with a stopwatch. Delay time should be between $3...6 \text{ sec.}$
- Adjusting
 - Run engine to operating temperature.
 - Adjust idle speed to $775...925 \text{ min}^{-1}$ with idle-speed-adjusting screw.
 - Loosen locknut on throttle-valve damper.
 - Raise engine speed to 2000 min^{-1} . Set throttle-valve damper so that it touches the throttle-plate lever.
(Turn throttle-valve damper in direction of bracket = longer delay time.
Turn throttle-valve damper away from bracket = shorter delay time.)
 - Check delay time. Increase engine speed to 2000 min^{-1} and measure the time span between release of the gas pedal and attainment of idle speed ($775...925 \text{ min}^{-1}$) with a stopwatch. Delay time should lie between approx. $3...6 \text{ sec.}$
If not → replace throttle-valve damper.

yes

Continued on H11/H12



- 3 = Throttle-valve damper
- 4 = Locknut (for setting throttle-valve damper)
- 5 = Throttle-plate lever
- 6 = Idle-speed-adjusting screw

H9

Uneven idle
SAAB 900 Turbo USA



H10

Uneven idle
SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

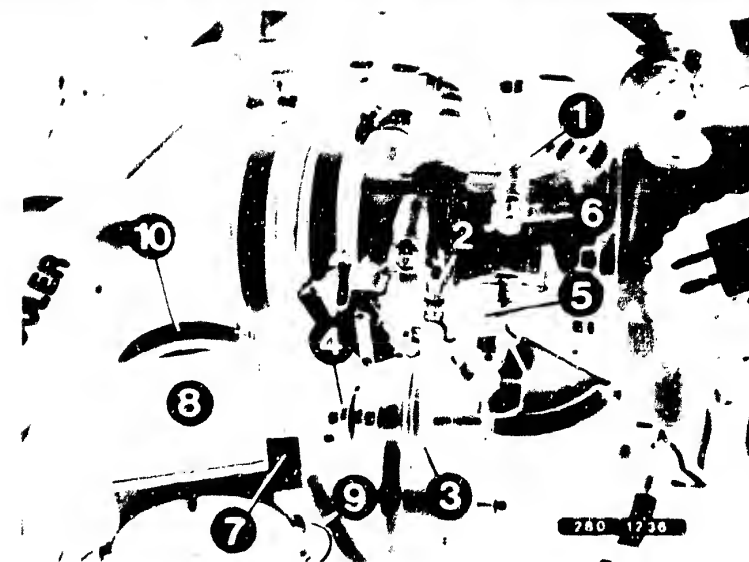
Idle speed and integrator voltage (CO content) not adjustable?

no

yes

Continued on H13/H14

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscrew SW5), and the voltage reader must always be checked afterwards.
 - Connect voltmeter (R_i at least 20k Ω /V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



- 6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment

H11

Uneven idle

SAAB 900 Turbo USA



H12

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

Idle actuator in good mechanical condition?

no

- Idle actuator is tested electrically and for functioning with the universal test adapter.
- Mechanical test
Idle actuator is tested for freedom of movement as follows:
 - Remove idle actuator (pull off hoses).
 - Remove plug.
 - Connect middle connection (term. 2) to battery voltage.
 - Connect outer connection (term. 1) to ground.
 - Ascertain by visual check whether rotary spool turns to end stop.
 - Change outer connection, i.e. connect term. 3 to ground. Rotary spool must now turn to opposite stop.Exchange defective idle actuator.
When installing idle actuator observe flow-through direction (arrow).

yes

Continued on H15/H16



4 = Idle actuator

H13

Uneven idle

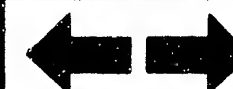
SAAB 900 Turbo USA

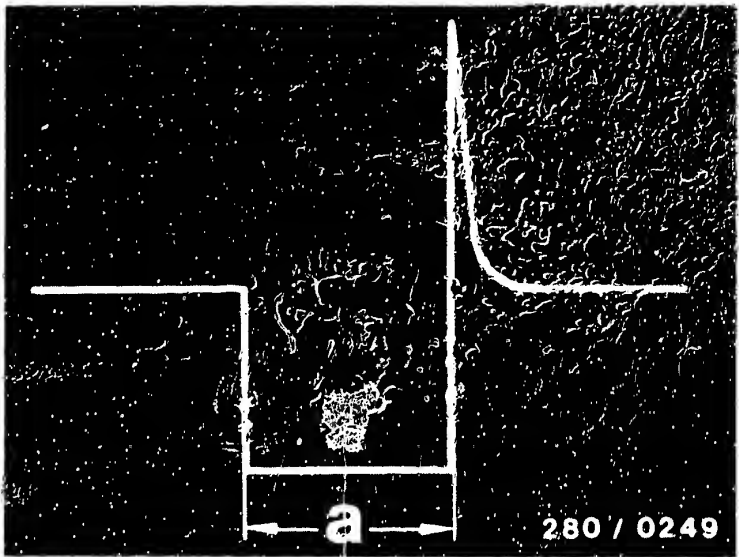
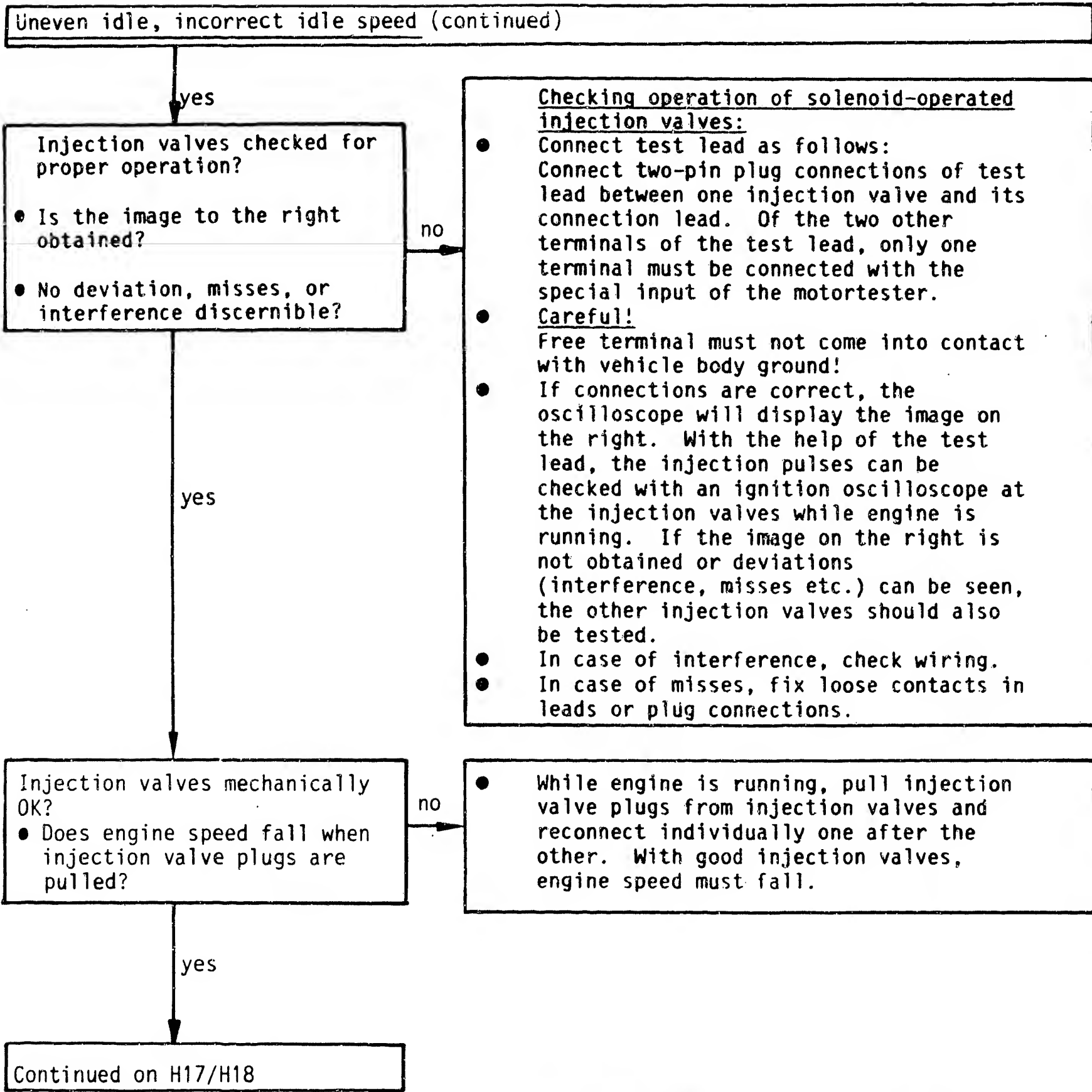


H14

Uneven idle

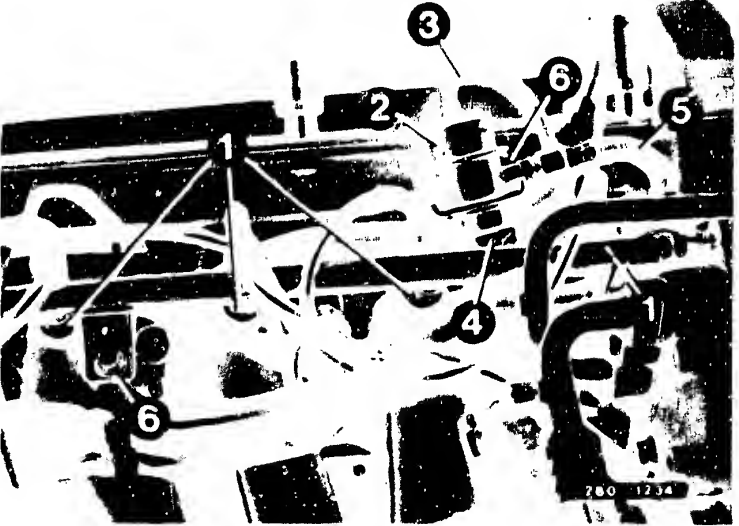
SAAB 900 Turbo USA





Injection pulse of a connected output stage (measured at injection valve)
a = Pulse length (dependent on engine load)

1 = Solenoid-operated injection valves



Uneven idle, incorrect idle speed (continued)

yes

Solenoid-operated injection valves OK?

• Removal and installation

no

yes

Continued on H19/H20

- Removal
Removing fuel-distribution pipe and solenoid-operated injection valves
 - Loosen fastening bolts on fuel-distribution pipe and on pressure regulator.
 - Take all 4 injection valves out of the cylinder head simultaneously and carefully.Changing injection valves
 - Remove electrical connection
 - Carefully push holding clamp out of groove.
 - Carefully pull defective injection valve out of fuel-distribution pipe.

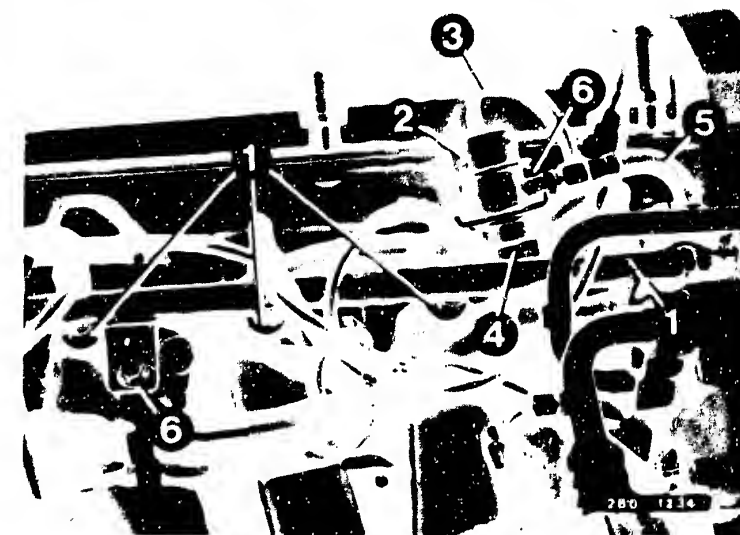
Careful! Catch fuel running out. Do not allow to get on hot engine parts.

Careful! Before installation, the two O-rings may be greased only slightly (silicone grease Ft 2 v 1). The other solenoid-operated injection valves must remain grease-free.
- Installation
 - Carefully insert new injection valve in fuel-distribution pipe.
 - Push holding clamp into groove until it engages (check junction for leakage).
 - Plug in electrical connection (good contact).
 - Carefully insert all 4 solenoid-operated injection valves simultaneously together with fuel-distribution pipe to intake manifold.

Note! Do not damage O-rings or injection-valve needles!

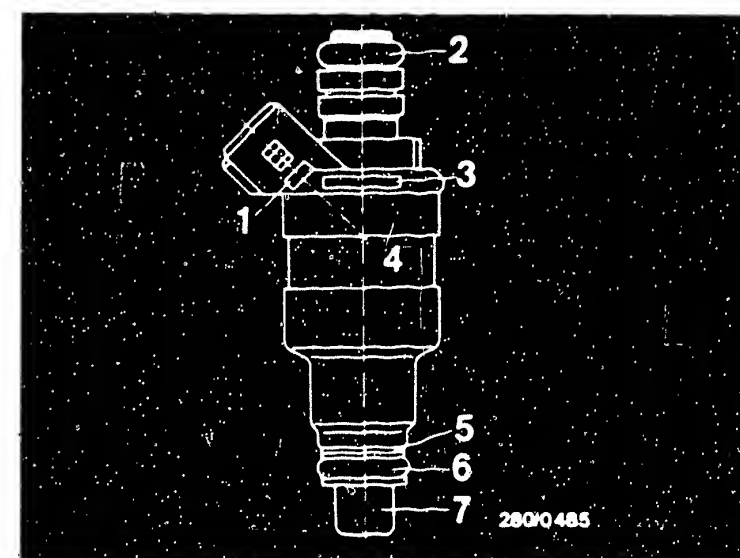
 - Fasten pressure regulator and fuel-distribution pipe with bolts (check for leakage).

After testing and installation, restore to original installed condition. Check for leakage.



1 = Injection valves
6 = Fastening bolts

1 = FD marking
2 = Upper O-ring
3 = Part number
4 = Injection valve
5 = Protective washer
6 = Lower O-ring
7 = Protection sleeve



H17

Uneven idle

SAAB 900 Turbo USA



H18

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes

Are all hose connections and electricals firmly connected? Visual check.
Has induction system been checked for leaks.

no

Check whether hoses of induction system and fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Correct leakage with new seals or by tightening connection screws.

Leakage inspection

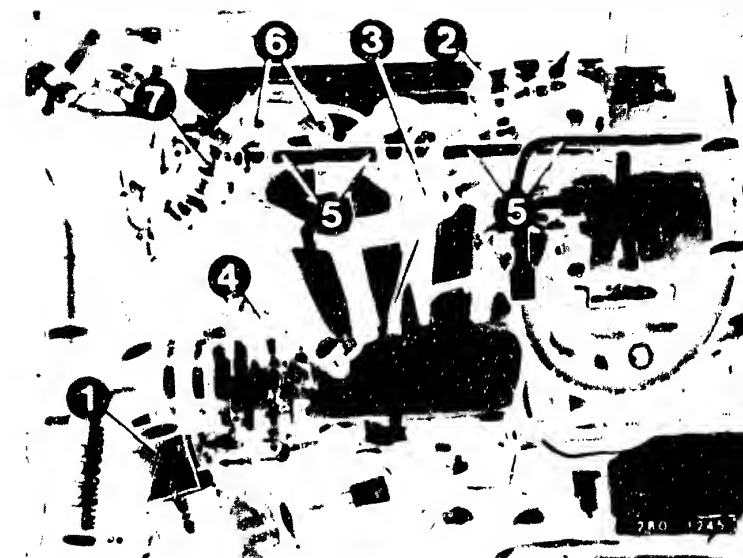
Seal off exhaust tail pipe, unscrew hose from air filter to air-mass sensor at air-mass sensor and seal off air-mass sensor duct (dust cover). Pull off hose after idle actuator. Seal off idle actuator connection. Blow air into hose to intake manifold using compressed-air gun (0.3 bar). Meanwhile, fully open throttle valve. Spray or brush on soapy water onto all sealing points. Bubble or foam formation indicates leakage.

Careful!

Reconnect all hoses and firmly tighten hose clamps. Check sealing.

yes

Continued on H21/H22



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Injection valves
- 6 = Ground terminals
- 7 = Idle actuator

H19

Uneven idle

SAAB 900 Turbo USA



H20

Uneven idle

SAAB 900 Turbo USA



Uneven idle, incorrect idle speed (continued)

yes
Idle speed and integrator voltage (CO content) not adjustable? Repeat.

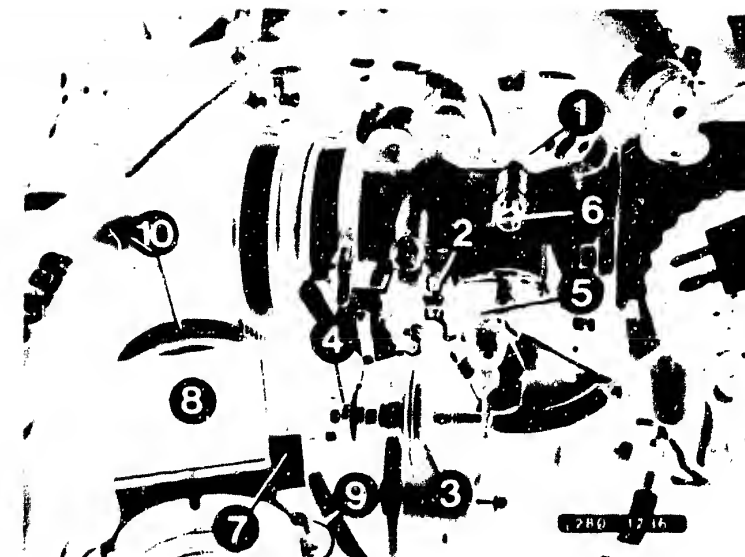
no

yes
Testing completed for customer complaint
"Uneven Idle, Incorrect Idle Speed".

Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates C3/C4).
- Engine not in good mechanical order (compression, valve setting, valve timing, worn camshaft).

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscrew SW5), and the voltage reader must always be checked afterwards.
 - Connect voltmeter (R_i at least 20k Ω /V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

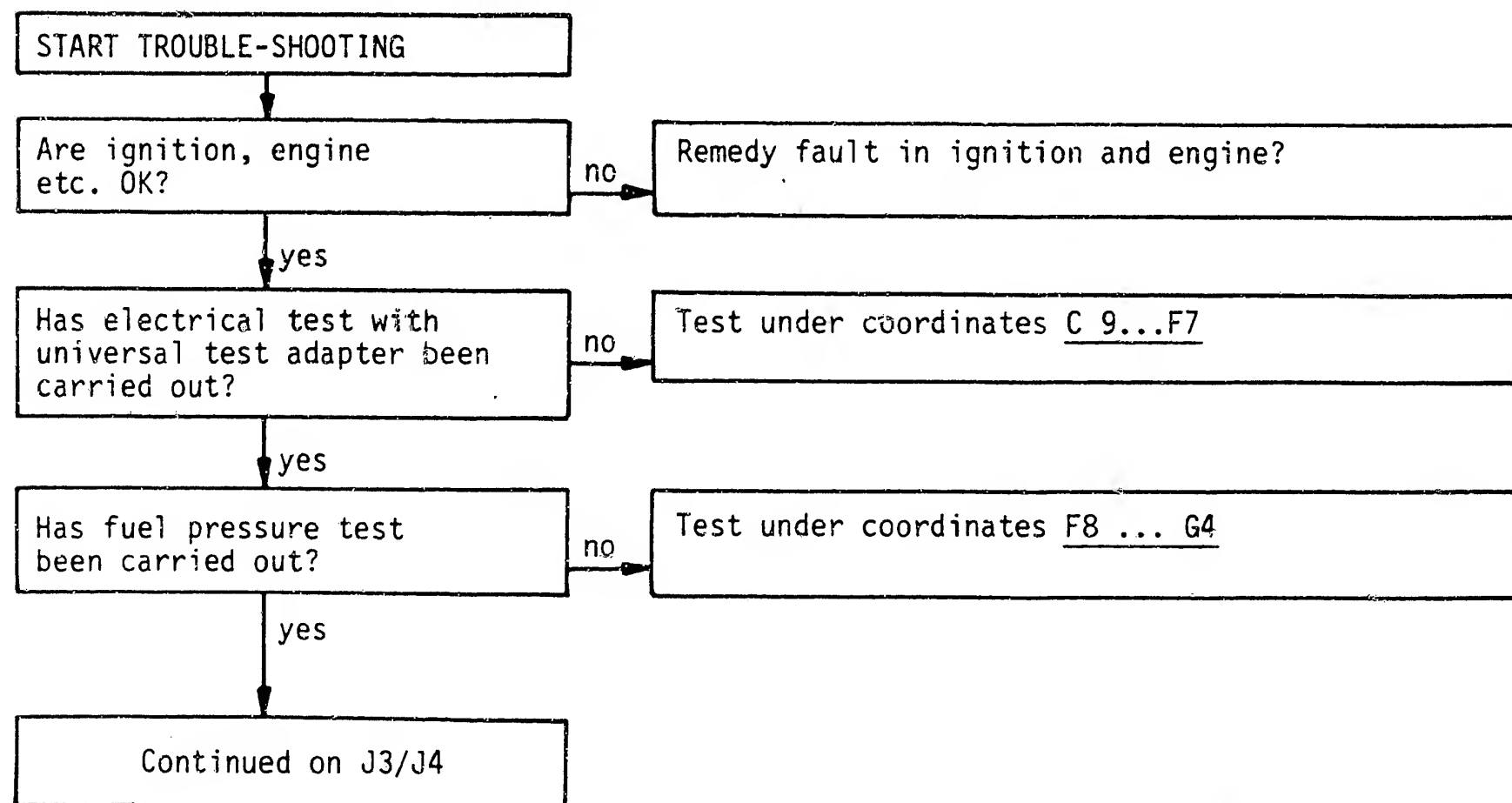
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



J1

Poor throttle take-up
SAAB 900 Turbo USA



J2

Poor throttle take-up
SAAB 900 Turbo USA



Poor throttle take-up (continued)

yes

Is throttle valve closed?

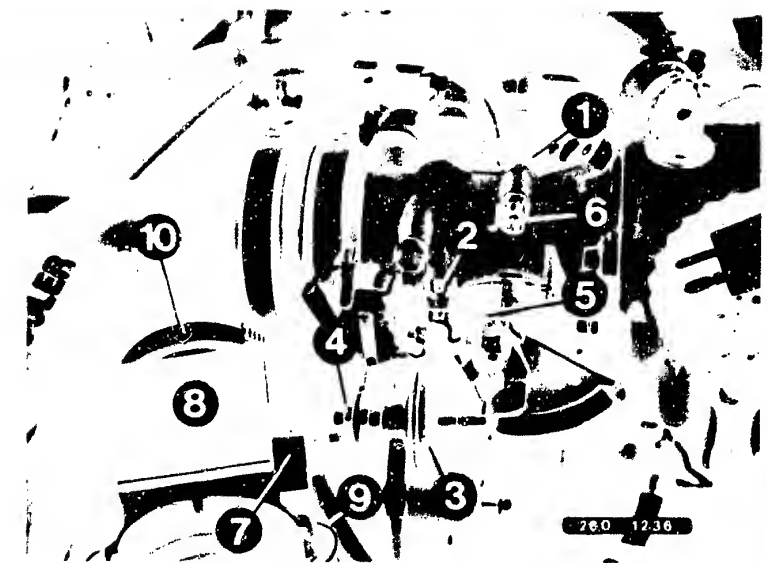
- Does throttle-plate lever hit against stop screw?

no

yes

Continued on J5/J6

- Test
Determine whether the throttle valve can be further closed, reducing engine speed.
- Throttle-valve adjustment:
 - Check whether throttle valve is centered in throttle housing.
 - Unscrew stop screw far enough so that there is no contact between stop screw and throttle-plate lever.
 - Screw stop screw in far enough so that stop screw touches throttle-plate lever.
 - Then screw in stop screw 3/4 more turns and lock with locknut.
This results in a play between throttle valve and throttle housing of approx. 0.05 mm.
- Check accelerator cable length
 - Accelerator cable must be at least long enough so that throttle valve is in idle position.
 - No play in accelerator cable.
 - Throttle valve must be fully open when gas pedal is fully depressed.



- 2 = Throttle-valve stop screw
- 3 = Throttle-valve damper
- 4 = Lock nut, for setting throttle-valve damper
- 5 = Throttle plate lever

J3

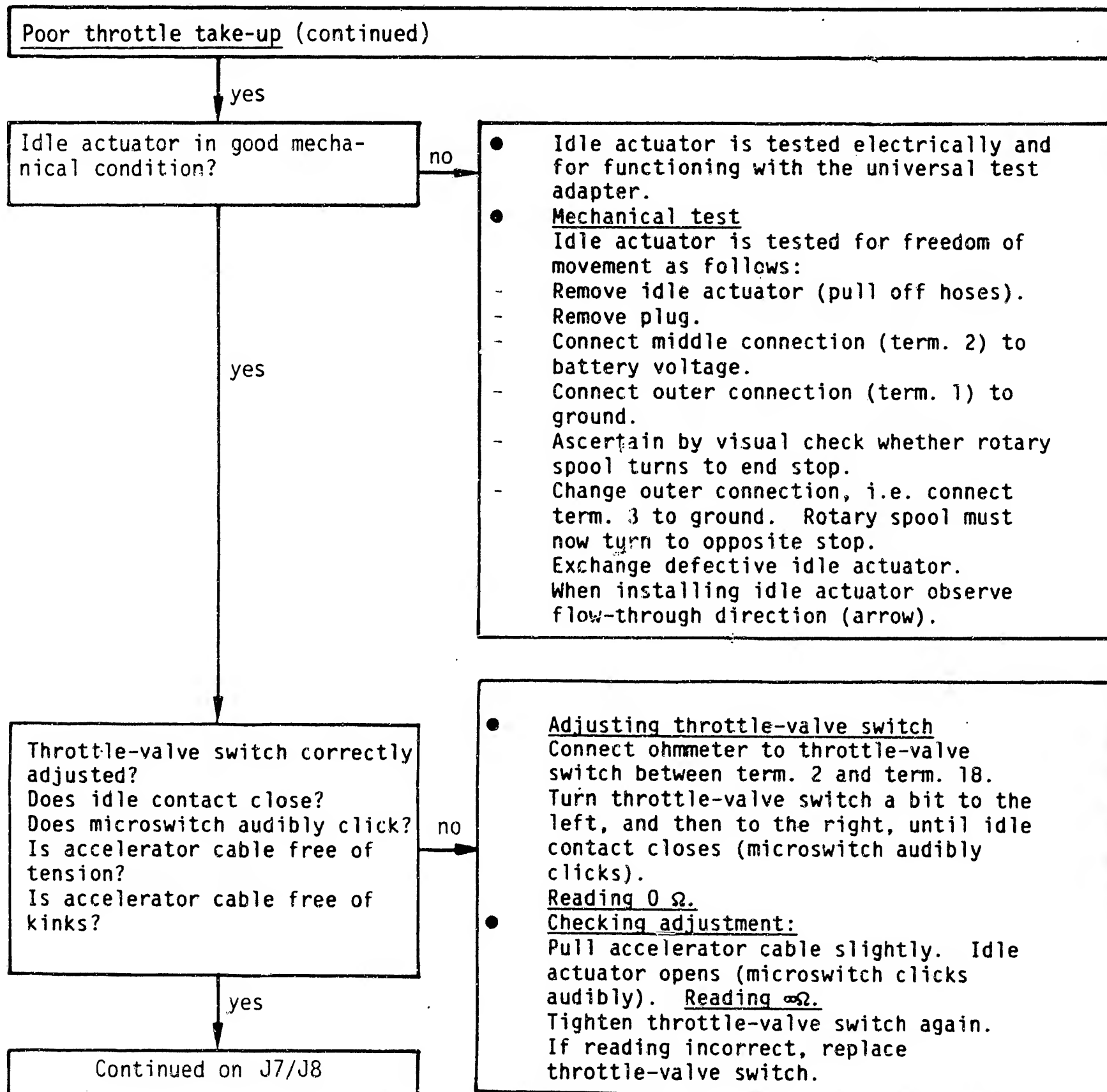
Poor throttle take-up
SAAB 900 Turbo USA



J4

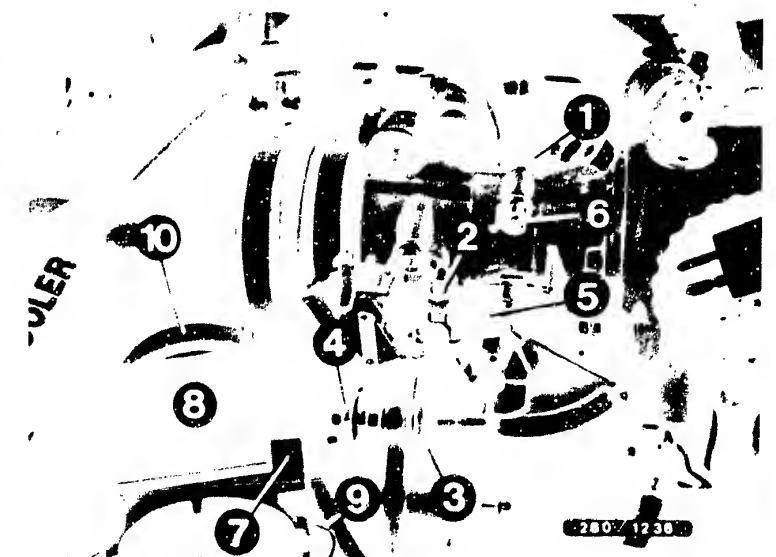
Poor throttle take-up
SAAB 900 Turbo USA





4 = Idle actuator

1 = Throttle-valve switch



J5

Poor throttle take-up
SAAB 900 Turbo USA



J6

Poor throttle take-up
SAAB 900 Turbo USA



Poor throttle take-up (continued)

yes

Is mechanical throttle-valve damper OK?

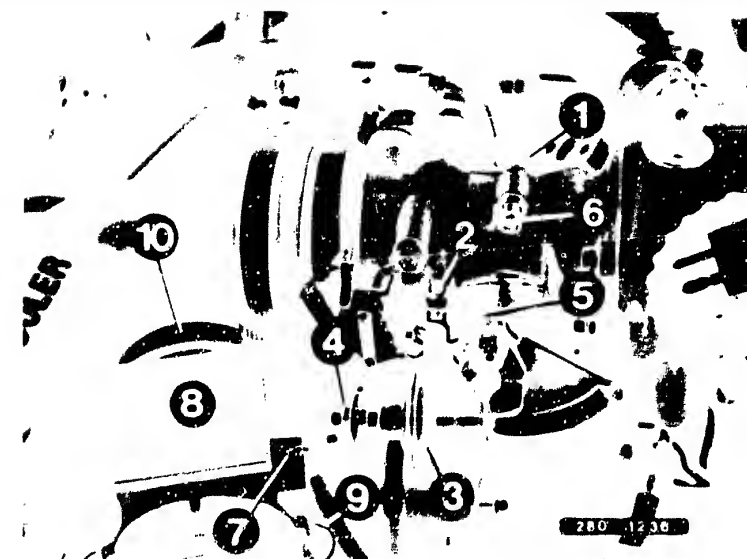
- Testing
- Adjustment

no

- Testing
 - Adjust idle speed to $775...925 \text{ min}^{-1}$ with engine at operating temperature.
 - Increase engine speed to 2000 min^{-1} and measure the time between releasing the gas pedal and attainment of idle speed with a stopwatch. Delay time should be between $3...6 \text{ sec.}$
- Adjusting
 - Run engine to operating temperature.
 - Adjust idle speed to $775...925 \text{ min}^{-1}$ with idle-speed-adjusting screw.
 - Loosen locknut on throttle-valve damper.
 - Raise engine speed to 2000 min^{-1} . Set throttle-valve damper so that it touches the throttle-plate lever.
(Turn throttle-valve damper in direction of bracket = longer delay time.
Turn throttle-valve damper away from bracket = shorter delay time.)
 - Check delay time. Increase engine speed to 2000 min^{-1} and measure the time span between release of the gas pedal and attainment of idle speed ($775...925 \text{ min}^{-1}$) with a stopwatch. Delay time should lie between approx. $3...6 \text{ sec.}$
If not → replace throttle-valve damper.

yes

Continued on J9/J10



- 3 = Throttle-valve damper
- 4 = Locknut (for setting throttle-valve damper)
- 5 = Throttle-plate lever
- 6 = Idle-speed-adjusting screw

J7

Poor throttle take-up
SAAB 900 Turbo USA



J8

Poor throttle take-up
SAAB 900 Turbo USA



Poor throttle take-up (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

Electrical test

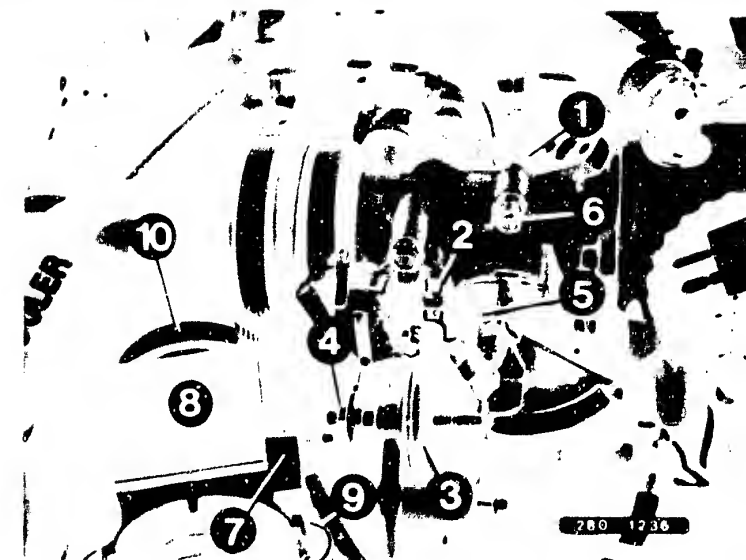
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0...1100 Ω
between term. 5 and term. 3: 3.6...4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

Continued on J11/J12



- 7 = Potentiometer for idle-mixture adjustment
8 = Hot-wire air-mass sensor
9 = Clamp fasteners
10 = Hose bands

J9

Poor throttle take-up
SAAB 900 Turbo USA



J10

Poor throttle take-up
SAAB 900 Turbo USA



Poor throttle take-up (continued)

yes

Are all hose connections and electricals firmly connected? Visual check.
Has induction system been checked for leaks.

no

Check whether hoses of induction system and fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Correct leakage with new seals or by tightening connection screws.

Leakage inspection

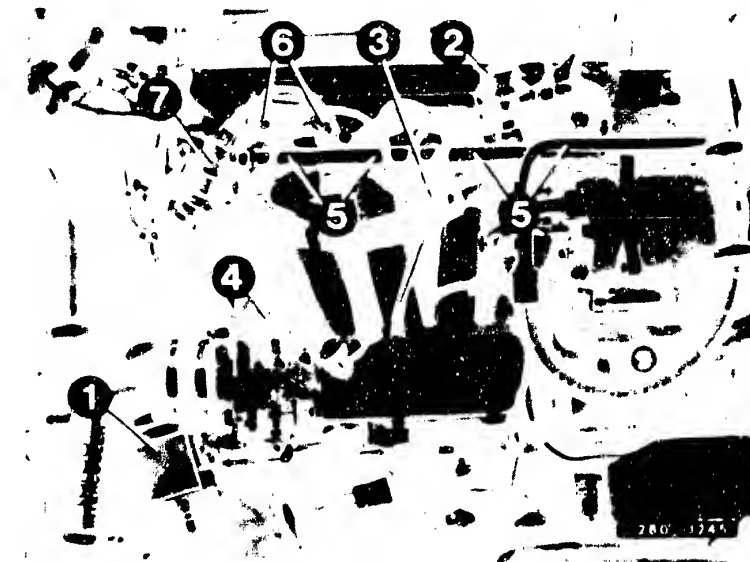
Seal off exhaust tail pipe, unscrew hose from air filter to air-mass sensor at air-mass sensor and seal off air-mass sensor duct (dust cover). Pull off hose after idle actuator. Seal off idle actuator connection. Blow air into hose to intake manifold using compressed-air gun (0.3 bar). Meanwhile, fully open throttle valve. Spray or brush on soapy water onto all sealing points. Bubble or foam formation indicates leakage.

Careful!

Reconnect all hoses and firmly tighten hose clamps. Check sealing.

yes

Continued on J13/J14



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Injection valves
- 6 = Ground terminals
- 7 = Idle actuator

J11

Poor throttle take-up
SAAB 900 Turbo USA



J12

Poor throttle take-up
SAAB 900 Turbo USA



Poor throttle take-up (continued)

yes

Idle speed and integrator voltage (CO content) not adjustable? Repeat.

no

yes

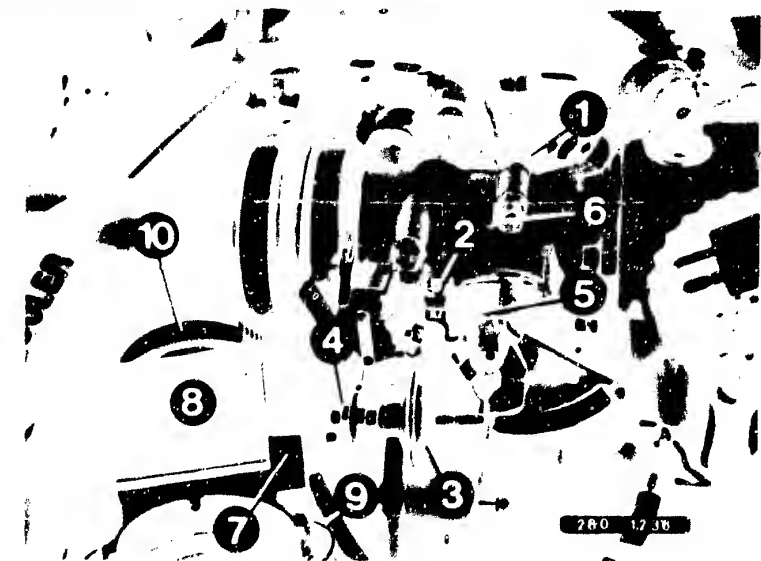
Testing completed for customer complaint

"Poor throttle take-up"

Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates C3/C4).
- Engine not in good mechanical order (compression, valve setting, valve timing, worn camshaft).

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscREW SW5), and the voltage reader must always be checked afterwards.
 - Connect voltmeter (R_i at least 20kΩ/V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



- 6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment



ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaint

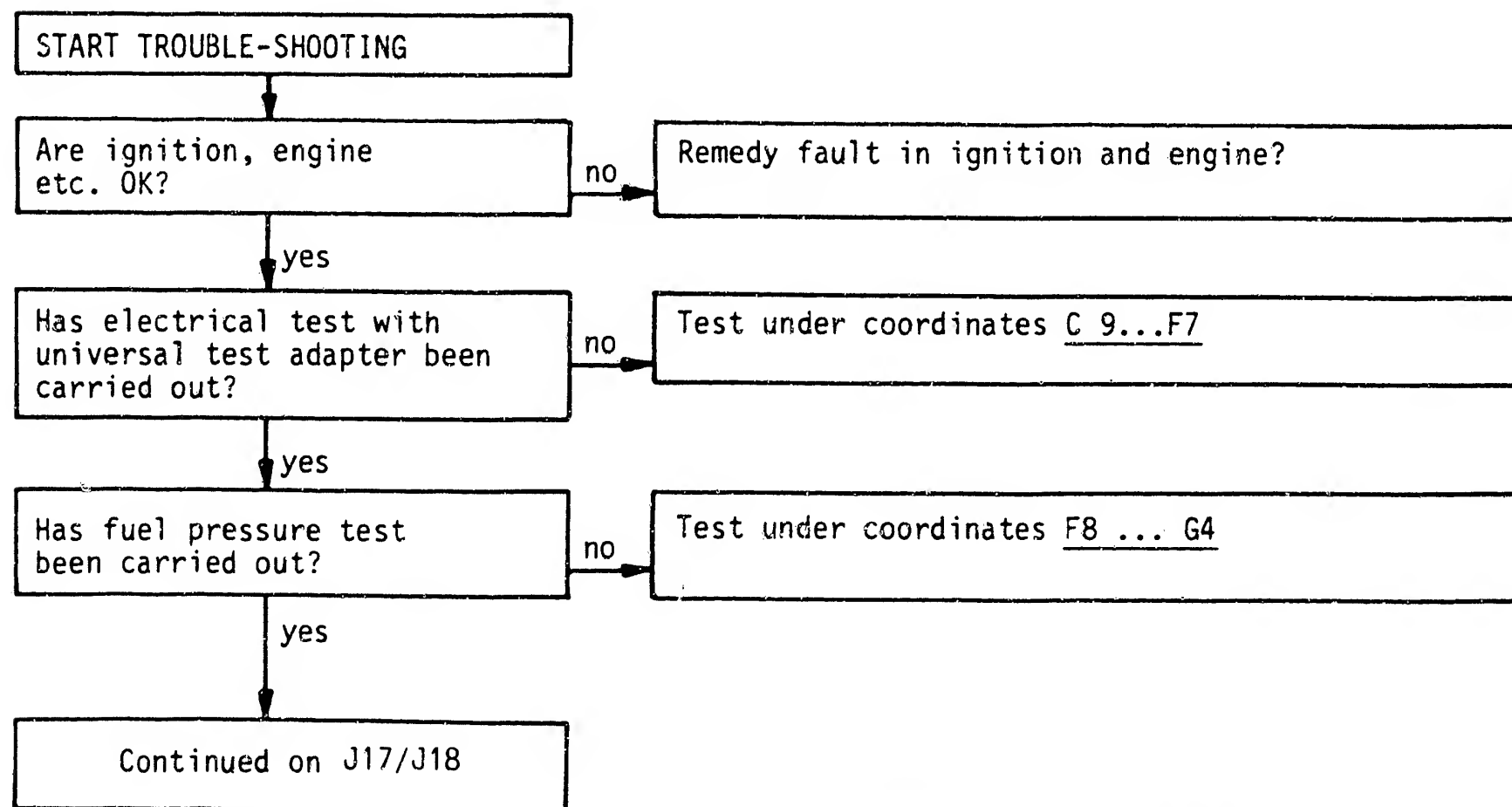
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



J 15

Engine missing
SAAB 900 Turbo USA



J 16

Engine missing
SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes

Fuel delivery of electric fuel pump OK?

Test specification:

at least 900 cm³/30sec

no

- Measuring fuel delivery:
For testing, undo junction between fuel return hose (at pressure regulator) and fuel return line (to fuel tank).
- Bridge safety circuit
 - Remove pump fuse no. 30
 - Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal at both ends)
 - Connect auxiliary lead between fuses no. 30 and no. 29.
 - Read fuel pressure on pressure gauge.
- Fuel pressure test specification
2.3...2.7 bar

Note!

After testing has been completed, auxiliary lead must be removed and plug connection restored to original state.

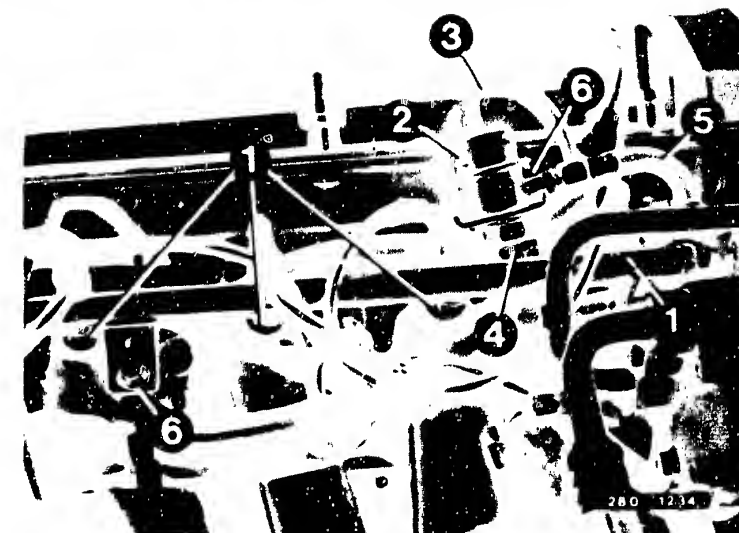
Remedy, if test specification not reached:

- Fuel filter clogged → replace.
- Voltage at fuel pump terminals with engine running: at least 12 V. If not, clean contacts, if necessary remove poor ground connection, replace leads. Check pump fuse.
- Pressure regulator defective → replace.

yes

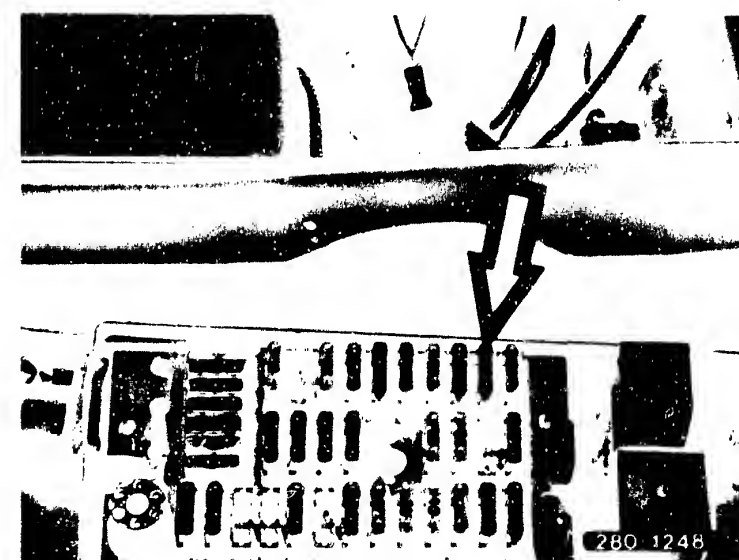
Continued on J19/J20

Continued on J19/J20



2 = Pressure regulator
3 = Intake manifold connection
4 = Fuel return line

Arrow = Pump fuse



J17

Engine missing

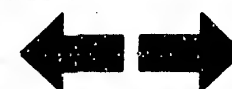
SAAB 900 Turbo USA



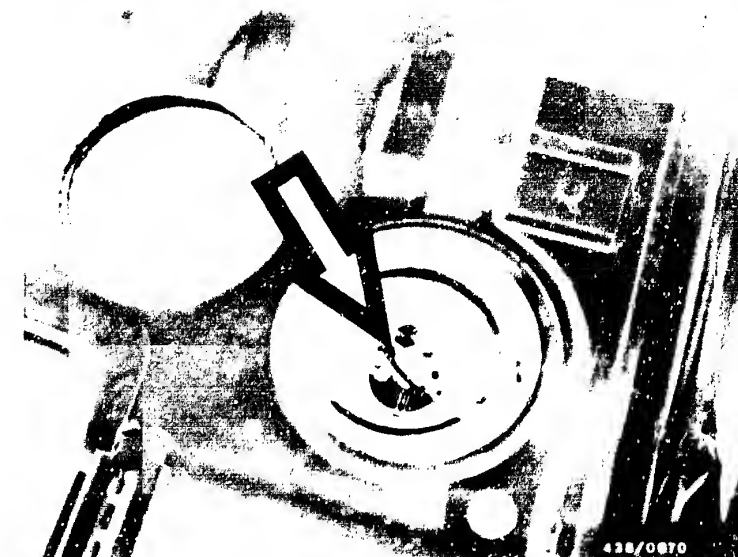
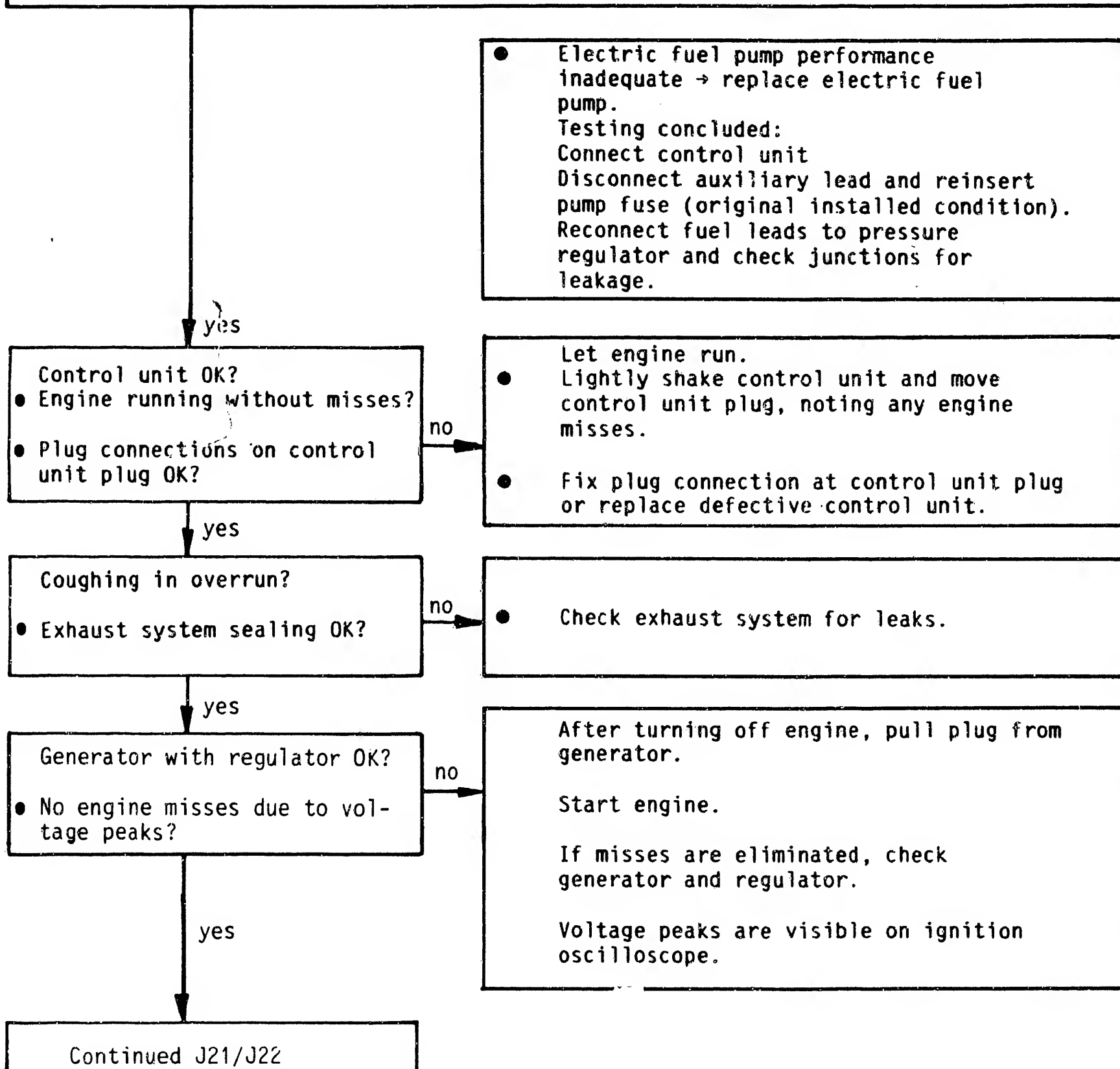
J18

Engine missing

SAAB 900 Turbo USA

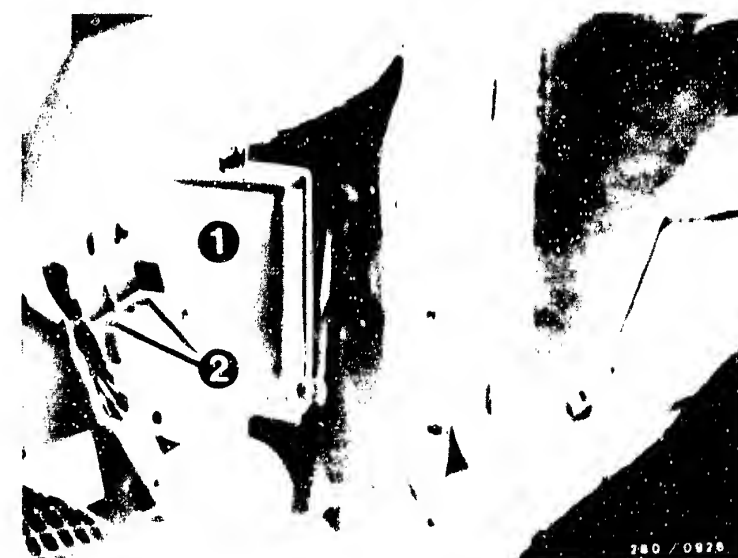


Engine missing under all operating conditions (continued)



Arrow = In-tank electric fuel pump

1 = Control unit
2 = Main and pump relays



Engine missing under all operating conditions (continued)

yes

Coughing in overrun?

Throttle valve closed?

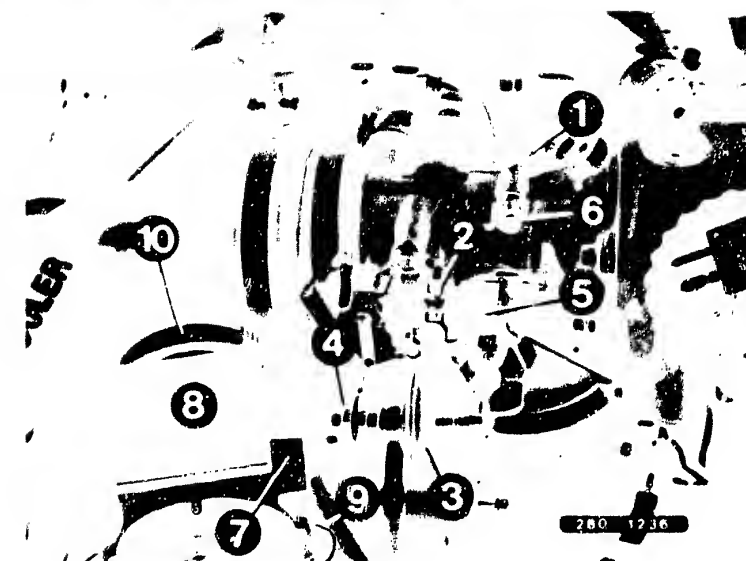
- Does throttle-plate lever hit against stop screw?

no

- Testing
Determine whether throttle valve can be further closed, and if engine speed is thus reduced.
- Throttle-valve adjustment:
 - Check whether throttle valve is centered in throttle-valve housing.
 - Unscrew stop screw far enough so that there is no contact between stop screw and throttle-plate lever.
 - Screw in stop screw far enough so that stop screw touches throttle-plate lever.
 - Then screw in stop screw another 3/4 turns and lock stop screw with lock nut. This results in a play between throttle valve and throttle-valve housing of approx. 0.05 mm.
- Check accelerator cable length
 - Accelerator cable must at least be long enough so that throttle valve is in idle position.
 - No play in accelerator cable.
 - Throttle valve must be fully opened when gas pedal is fully depressed.

yes

Continued on J23/J24



- 2 = Throttle-valve stop screw
- 3 = Throttle-valve damper
- 4 = Lock nut for adjusting throttle-valve damper
- 5 = Throttle-plate lever

J21

Engine missing
SAAB 900 Turbo USA



J22

Engine missing
SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes

Injection valve operation checked? Injection signal inspected for misses?

- Do injection pulses show no interference or misses?
- Wiring OK?
- No loose contacts in plug connections?

no

- Connect test lead as follows: Connect two-pin plug connections of test lead between one injection valve and its connection lead. Of the two other terminals of the test lead, only one terminal must be connected with the special input of the motortester.

- Free terminal must not come into contact with vehicle body ground!
- If connections are correct, the oscilloscope will display the image on the right. With the help of the test lead, the injection pulses can be checked with an ignition oscilloscope at the injection valves while engine is running. If the image on the right is not obtained or deviations (interference, misses etc.) can be seen, the other injection valves should also be tested.
- In case of interference, check wiring.
- In case of misses, fix loose contacts in leads or plug connections.

yes

Injection valves mechanically OK?

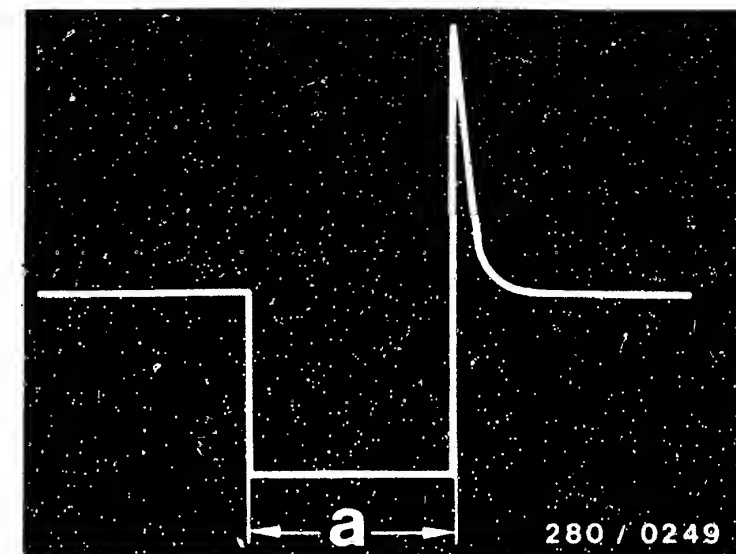
- Does engine speed fall when injection valve plugs are pulled?

no

- While engine is running, pull injection valve plugs from injection valves and reconnect individually one after the other. With good injection valves, engine speed must fall.

yes

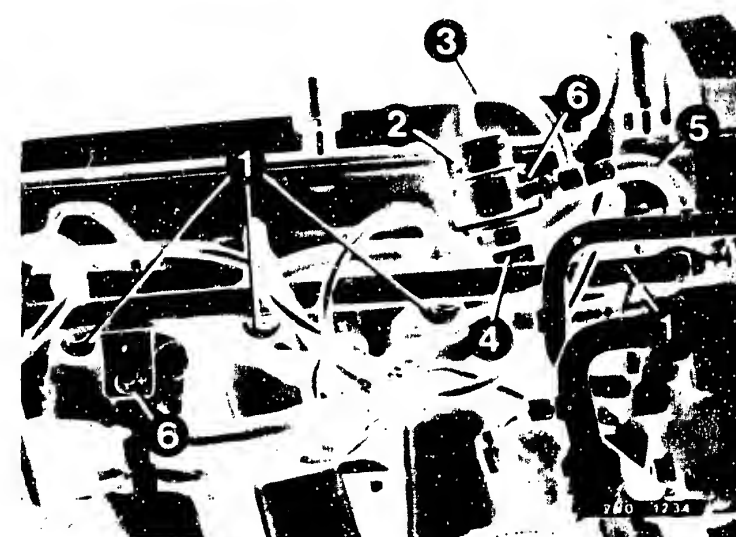
Continued on K1/K2



Injection pulse of a connected output stage (measured at injection valve)

a = Pulse length (dependent on engine load)

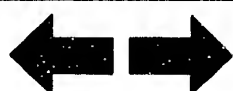
1 = Solenoid-operated injection valves



J23

Engine missing

SAAB 900 Turbo USA



J24

Engine missing

SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

Solenoid-operated injection valves OK?

- Removal and installation
- O-ring OK?

yes

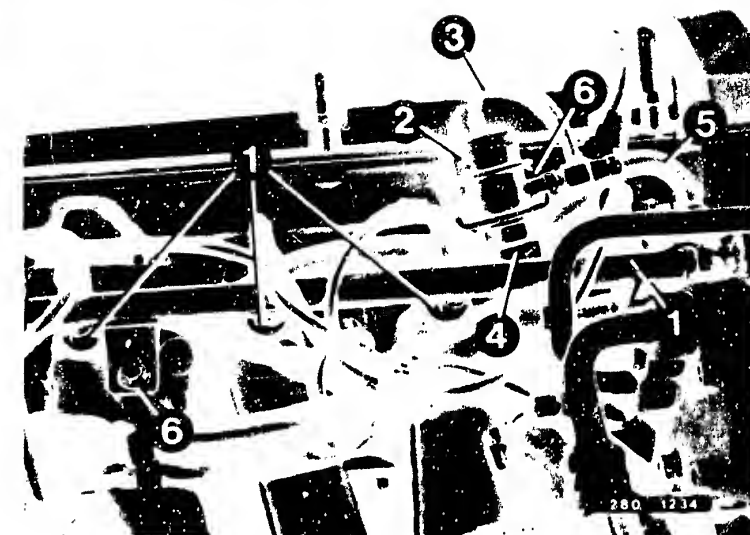
yes

Continued on K5/K6

no

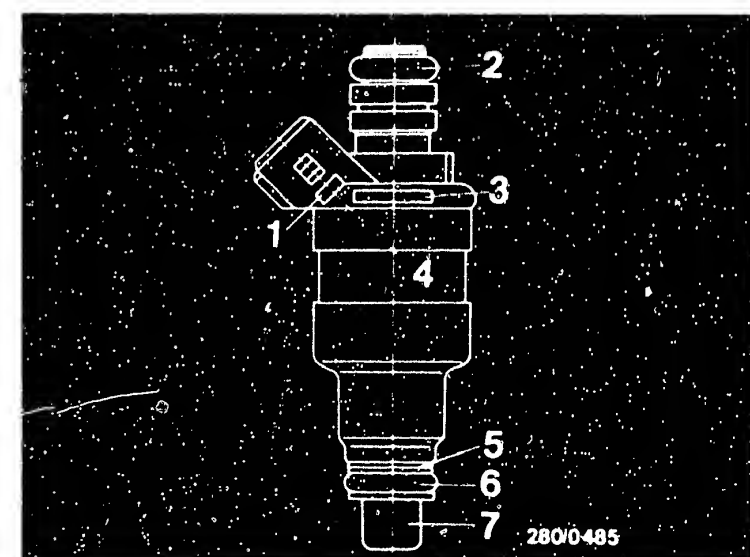
- Removal
Removing fuel-distribution pipe and solenoid-operated injection valves
 - Loosen fastening bolts on fuel-distribution pipe and on pressure regulator.
 - Take all 4 injection valves out of the cylinder head simultaneously and carefully.
 - Changing injection valves
 - Remove electrical connection
 - Carefully push holding clamp out of groove.
 - Carefully pull defective injection valve out of fuel-distribution pipe.
Careful! Catch fuel running out. Do not allow to get on hot engine parts.
 - O-ring defective or swollen
Cut up lower O-ring (intake manifold).
Careful! Do not damage protection sleeve. Pull new O-ring over protection sleeve and its shoulder, avoiding damage to any parts. Use parts set 1 287 010 704. When working on solenoid-operated injection valves do not damage valve needles.
If upper O-ring (fuel-distributor pipe connection) is swollen or damaged, it must likewise be replaced.
- Caution!
The two O-rings may be only slightly greased before installation (silicon grease Ft 2 v 1). The other injection valve parts must remain grease-free.

Continued on K3/K4



1 = Injection valves
6 = Fastening bolts

1 = FD marking
2 = Upper O-ring
3 = Part number
4 = Injection valve
5 = Protective washer
6 = Lower O-ring
7 = Protection sleeve



K1

Engine missing
SAAB 900 Turbo USA



K2

Engine missing
SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes

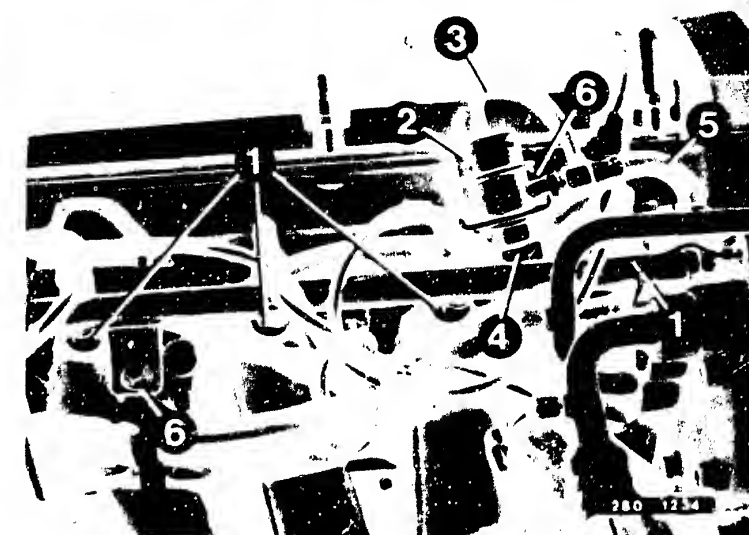
- Installation

- Carefully insert new solenoid-operated injection valve on fuel-distribution pipe.
- Push holding clamp into groove until it engages (check junction for leakage).
- Plug on electrical connection (good contact).
- Carefully insert all 4 solenoid-operated injection valves into intake manifold simultaneously with the fuel-distribution pipe.

Caution!

Do not injure O-rings or injection valve needles!

- Fasten pressure regulator and fuel-distribution pipe with bolts (check for leaks).
- After testing and installation, restore to original installed condition. Check for leakage.



1 = Injection valves

Continued on K5/K6

K3

Engine missing

SAAB 900 Turbo USA



K4

Engine missing

SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

Electrical test

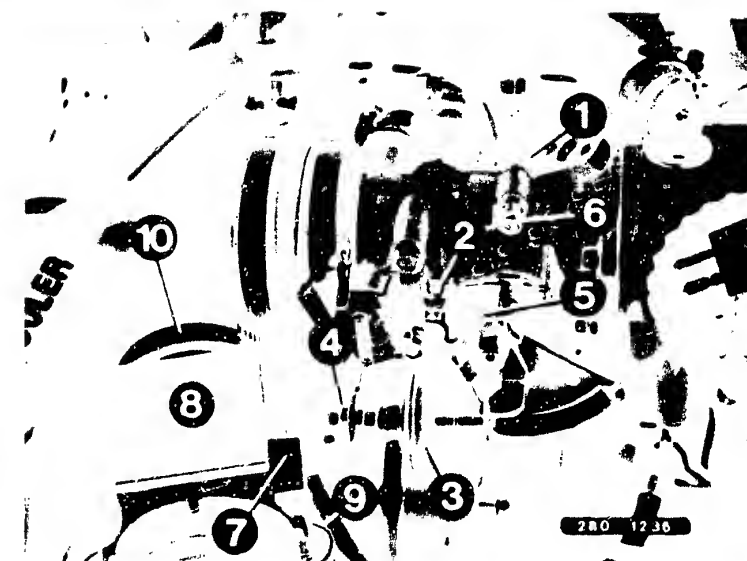
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0...1100 Ω
between term. 5 and term. 3: 3.6...4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

Continued on K7/K8



- 7 = Potentiometer for idle-mixture adjustment
- 8 = Hot-wire air-mass sensor
- 9 = Clamp fasteners
- 10 = Hose bands

K5

Engine missing

SAAB 900 Turbo USA



K6

Engine missing

SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes

Are all hose connections and electricals firmly connected? Visual check.
Has induction system been checked for leaks.

no

Check whether hoses of induction system and fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Correct leakage with new seals or by tightening connection screws.

Leakage inspection

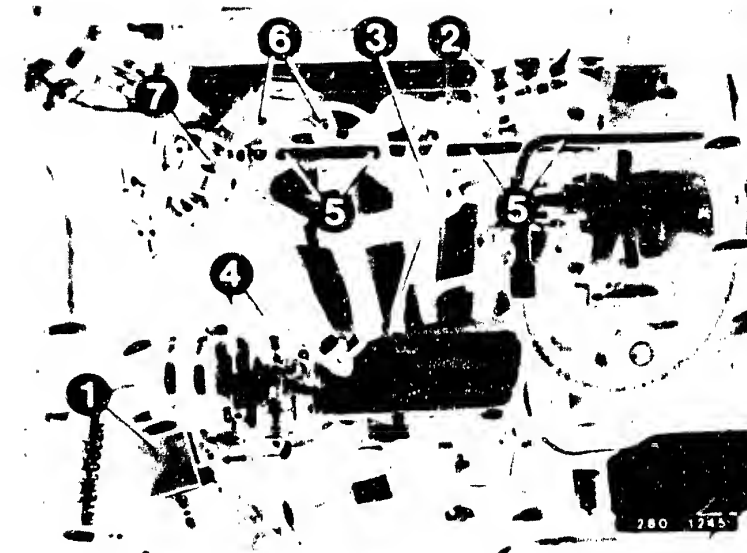
Seal off exhaust tail pipe, unscrew hose from air filter to air-mass sensor at air-mass sensor and seal off air-mass sensor duct (dust cover). Pull off hose after idle actuator. Seal off idle actuator connection. Blow air into hose to intake manifold using compressed-air gun (0.3 bar). Meanwhile, fully open throttle valve. Spray or brush on soapy water onto all sealing points. Bubble or foam formation indicates leakage.

Careful!

Reconnect all hoses and firmly tighten hose clamps. Check sealing.

yes

Continued on K9/K10



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Injection valves
- 6 = Ground terminals
- 7 = Idle actuator

K7

Engine missing

SAAB 900 Turbo USA



K8

Engine missing

SAAB 900 Turbo USA



Engine missing under all operating conditions (continued)

yes
Idle speed and integrator voltage (CO content) not adjustable?

no

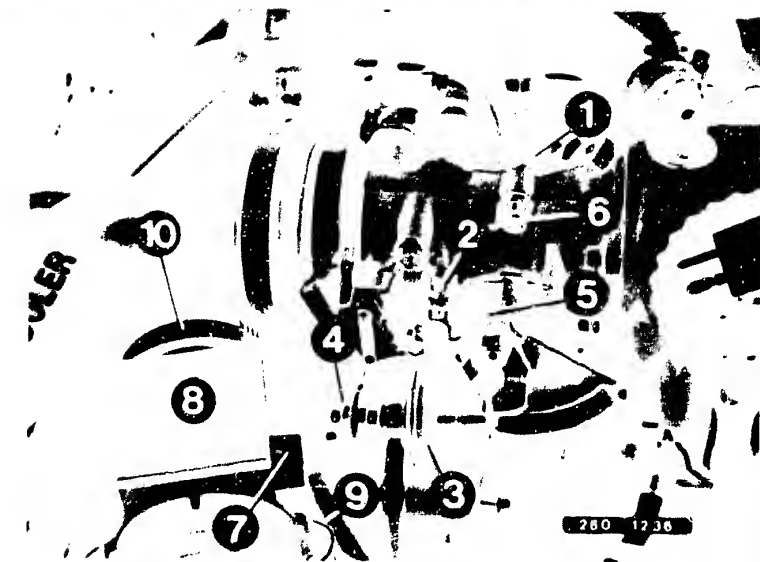
yes
Testing completed for customer complaint

"Engine missing under all operating conditions"

Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates C3/C4).
- Engine not in good mechanical order (compression, valve setting, valve timing, worn camshaft).

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscrew SW5), and the voltage reader must always be checked afterwards.
 - Connect voltmeter (R_i at least 20k Ω /V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment

K9

Engine missing
SAAB 900 Turbo USA



K10

Engine missing
SAAB 900 Turbo USA



FUEL CONSUMPTION TOO HIGH

Trouble-shooting program according to customer complaint

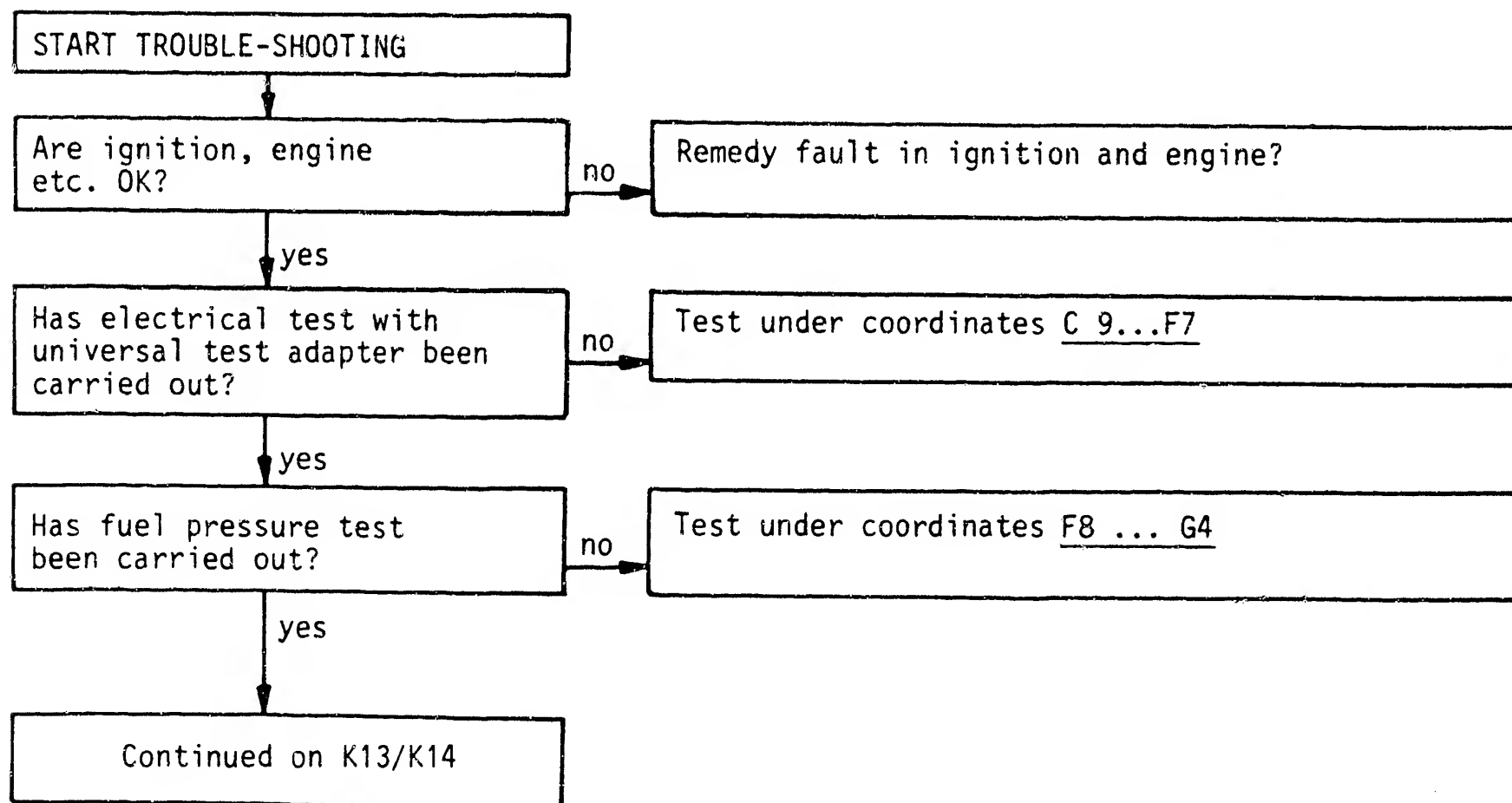
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



K11

Fuel consumption too high
SAAB 900 Turbo USA



K12

Fuel consumption too high
SAAB 900 Turbo USA



Fuel consumption too high (continued)

yes

Solenoid-operated injection valve sealing OK?

yes

Continued on K15/K16

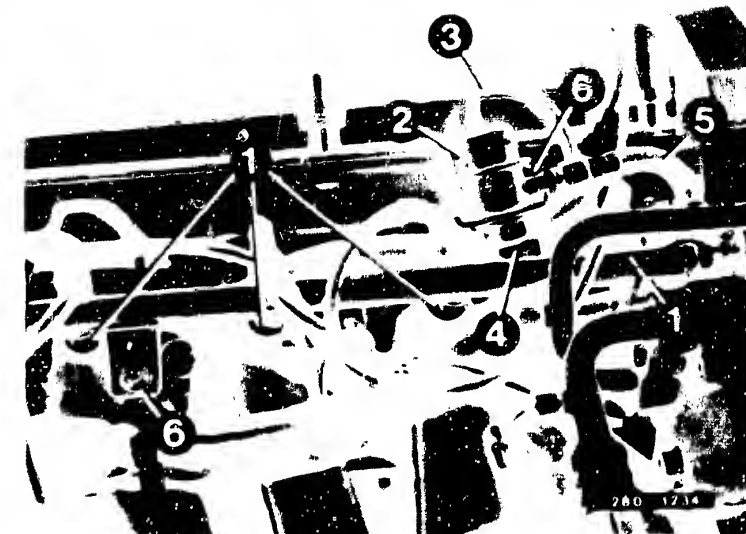
Checking sealing of solenoid-operated injection valves:

- Remove fuel-distribution pipe with injection valve:
 - Loosen fastening screws on fuel-distribution pipe and pressure regulator.
 - Pull all 4 injection valves out of the cylinder head simultaneously and carefully.
- Build up fuel pressure:
 - Bridge safety circuit
 - Pull out pump fuse no. 30.
 - Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal at each end)
 - Connect auxiliary lead between fuses no. 30 and no. 29.
 - In-tank electric fuel pump should operate.
- Test specification:

Within 60 sec. there must be no drop formation at the mouth of the solenoid-operated injection valve. In case of fault, exchange injection valve.
- Removal
 - Remove electrical connection.
 - Carefully push holding clamp out of groove.
 - Carefully pull injection valve out of fuel-distribution pipe.

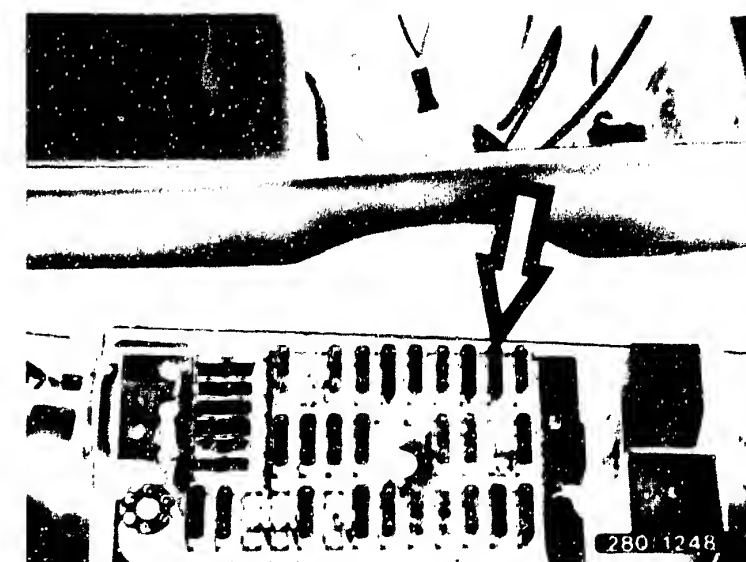
Caution! Catch any fuel running out. Do not allow to drop onto hot engine parts.

Continued on K15/K16



1 = Injection valves
6 = Fastening screws

Arrow = Pump fuse



K13

Fuel consumption too high
SAAB 900 Turbo USA



K14

Fuel consumption too high
SAAB 900 Turbo USA



Fuel consumption too high (continued)

yes

Installation

Caution!

Before installation, the two O-rings may only be greased lightly (silicone grease Ft 2 v 1).

The other solenoid-operated injection valve parts must remain grease-free.

- Carefully insert new injection valve into fuel-distribution pipe.
- Push holding clamp into groove on injection valve until clamp engages. (Check junction for leakage)

Caution!

After testing, restore original installed condition. Check sealing (extraneous air).

Are all wheels free from braking action

no

Adjust handbrake or drum brake so that it is friction-free.

yes

Are injection valves in good mechanical order?

no

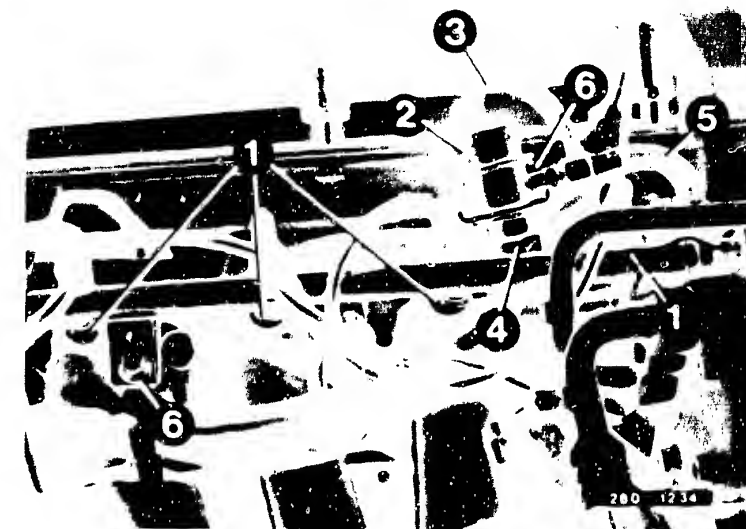
- Does engine speed fall when individual injection valve plugs are pulled?

- While engine is running, individually unplug and plug injection-valve plugs from injection valves individually one after the other.

If injection valve is OK, engine speed must fall.

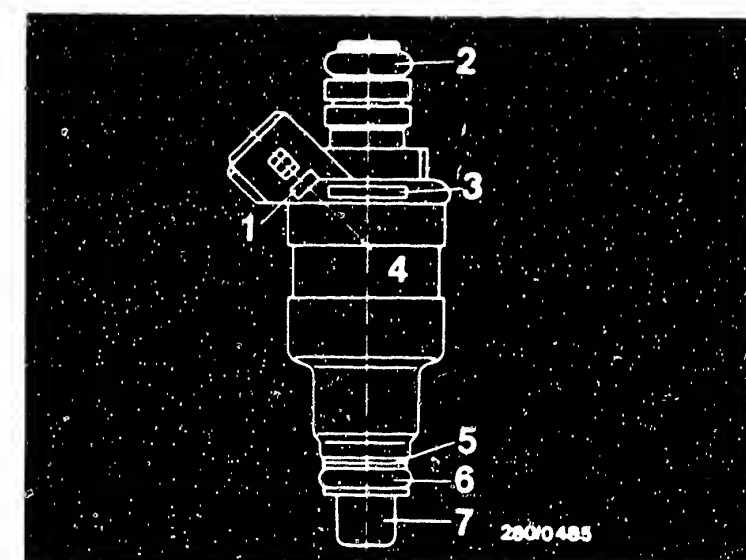
yes

Continued on K17/K18



1 = Injection valve
6 = Fastening bolts

1 = FD marking
2 = Upper O-ring
3 = Order number
4 = Injection valve
5 = Support washer (yellow 2 mm)
6 = Lower O-ring
7 = Protection sleeve



K15

Fuel consumption too high
SAAB 900 Turbo USA



K16

Fuel consumption too high
SAAB 900 Turbo USA



Fuel consumption too high (continued)

yes

Solenoid-operated injection valves OK?

- Removal and installation
- O-ring OK?

no

yes

Continued on K21/K22

Removal

Removing fuel-distribution pipe and solenoid-operated injection valves

- Loosen fastening bolts on fuel-distribution pipe and on pressure regulator.
- Take all 4 injection valves out of the cylinder head simultaneously and carefully.

Changing injection valves

- Remove electrical connection
- Carefully push holding clamp out of groove.
- Carefully pull defective injection valve out of fuel-distribution pipe.

Careful! Catch fuel running out. Do not allow to get on hot engine parts.

O-ring defective or swollen

Cut up lower O-ring (intake manifold).

Careful! Do not damage protection sleeve.

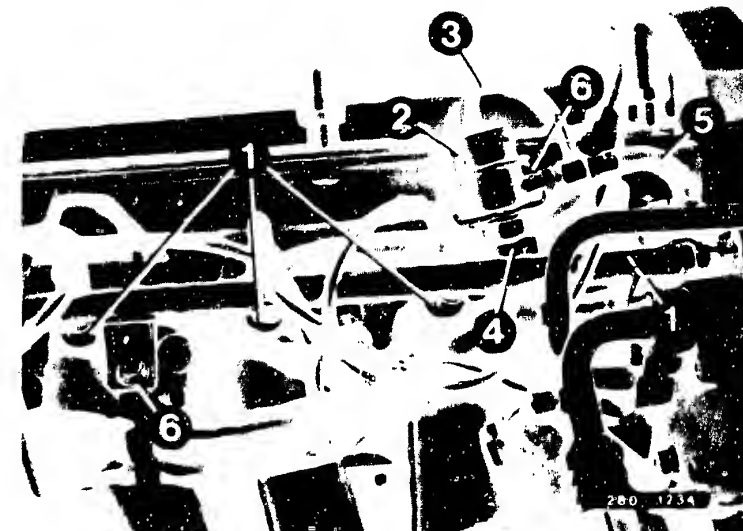
Pull new O-ring over protection sleeve and its shoulder, avoiding damage to any parts. Use parts set 1 287 010 704. When working on solenoid-operated injection valves do not damage valve needles.

If upper O-ring (fuel-distributor pipe connection) is swollen or damaged, it must likewise be replaced.

Caution!

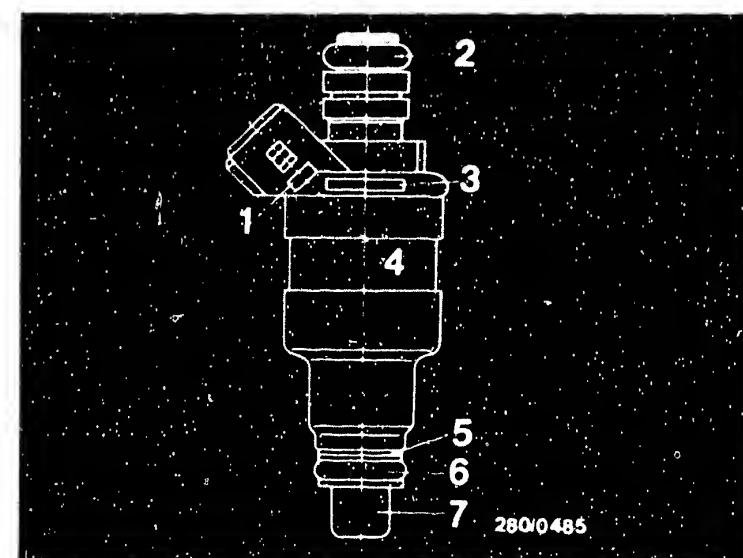
The two O-rings may be only slightly greased before installation (silicon grease Ft 2 v 1). The other injection valve parts must remain grease-free.

Continued on K19/K20



1 = Injection valves
6 = Fastening bolts

1 = FD marking
2 = Upper O-ring
3 = Part number
4 = Injection valve
5 = Protective washer
6 = Lower O-ring
7 = Protection sleeve



K17

Fuel consumption too high
SAAB 900 Turbo USA



K18

Fuel consumption too high
SAAB 900 Turbo USA



yes

Continued on K21/K22

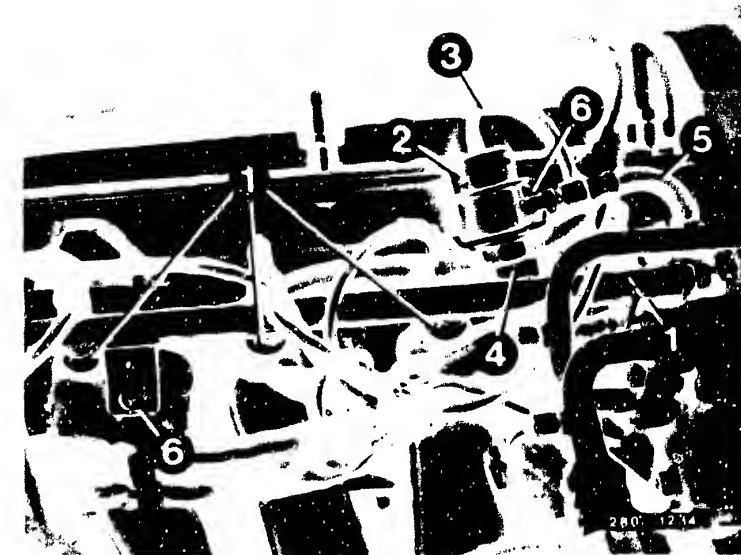
- Installation

- Carefully insert new solenoid-operated injection valve on fuel-distribution pipe.
- Push holding clamp into groove until it engages (check junction for leakage).
- Plug on electrical connection (good contact).
- Carefully insert all 4 solenoid-operated injection valves into intake manifold simultaneously with the fuel-distribution pipe.

Caution!

Do not injure O-rings or injection valve needles!

- Fasten pressure regulator and fuel-distribution pipe with bolts (check for leaks).
- After testing and installation, restore to original installed condition. Check for leakage.



1 = Injection valves

1 = FD marking

2 = Upper O-ring

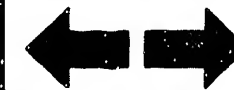
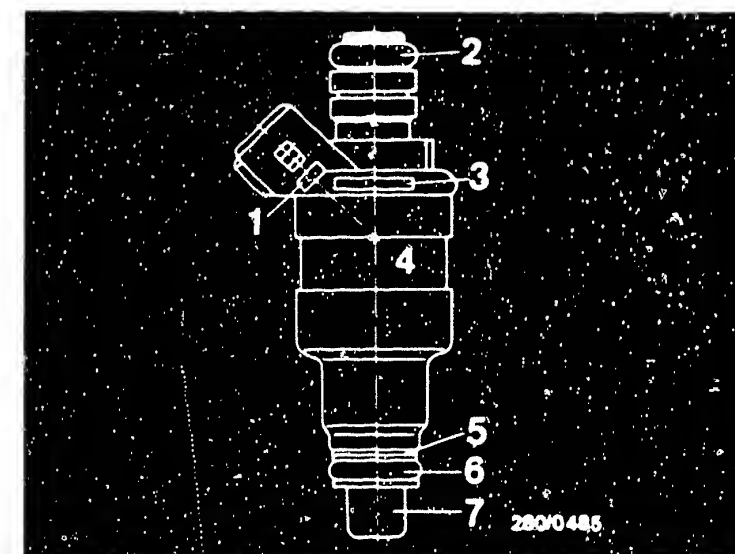
3 = Part number

4 = Injection valve

5 = Supporting plate
(yellow 2 mm)

6 = Lower O-ring

7 = Protection sleeve



Fuel consumption too high (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

Electrical test

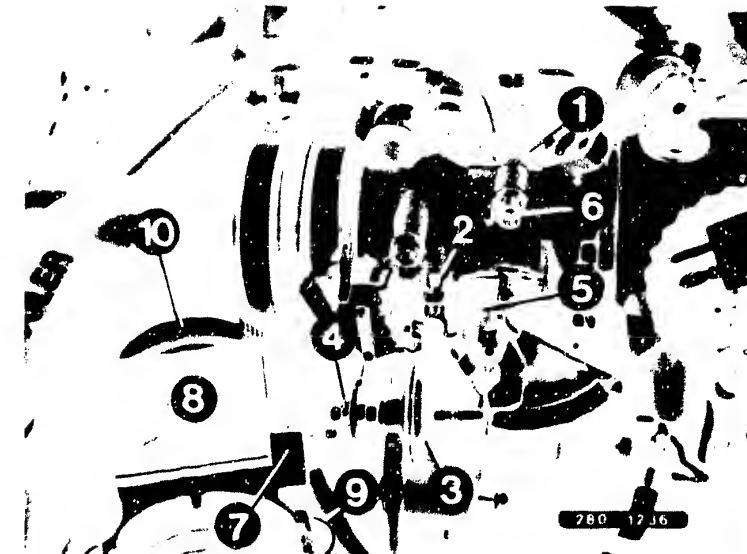
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0...1100 Ω
between term. 5 and term. 3: 3.6...4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

Continued on K23/K24



- 7 = Potentiometer for idle-mixture adjustment
- 8 = Hot-wire air-mass sensor
- 9 = Clamp fasteners
- 10 = Hose bands

K21

Fuel consumption too high
SAAB 900 Turbo USA



K22

Fuel consumption too high
SAAB 900 Turbo USA



Fuel consumption too high (continued)

yes

Idle speed and integrator voltage (CO content) not adjustable?

no

yes

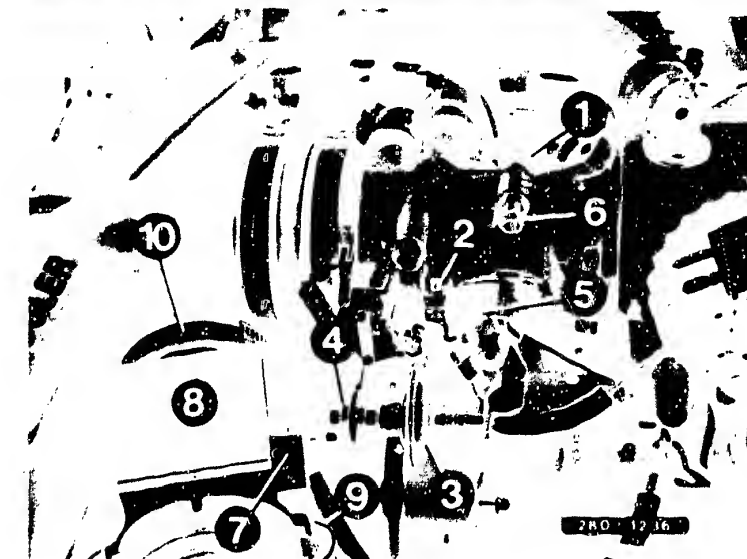
Testing completed for customer complaint

"Fuel consumption too high"

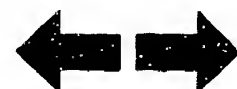
Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates C3/C4).
- Engine not in good mechanical order (compression, valve setting, valve timing, worn camshaft).

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscREW SW5), and the voltage reader must always be checked afterwards .
 - Connect voltmeter (R_i at least 20kΩ/V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment



INSUFFICIENT MAXIMUM POWER OR MAXIMUM SPEED

Trouble-shooting program according to customer complaint

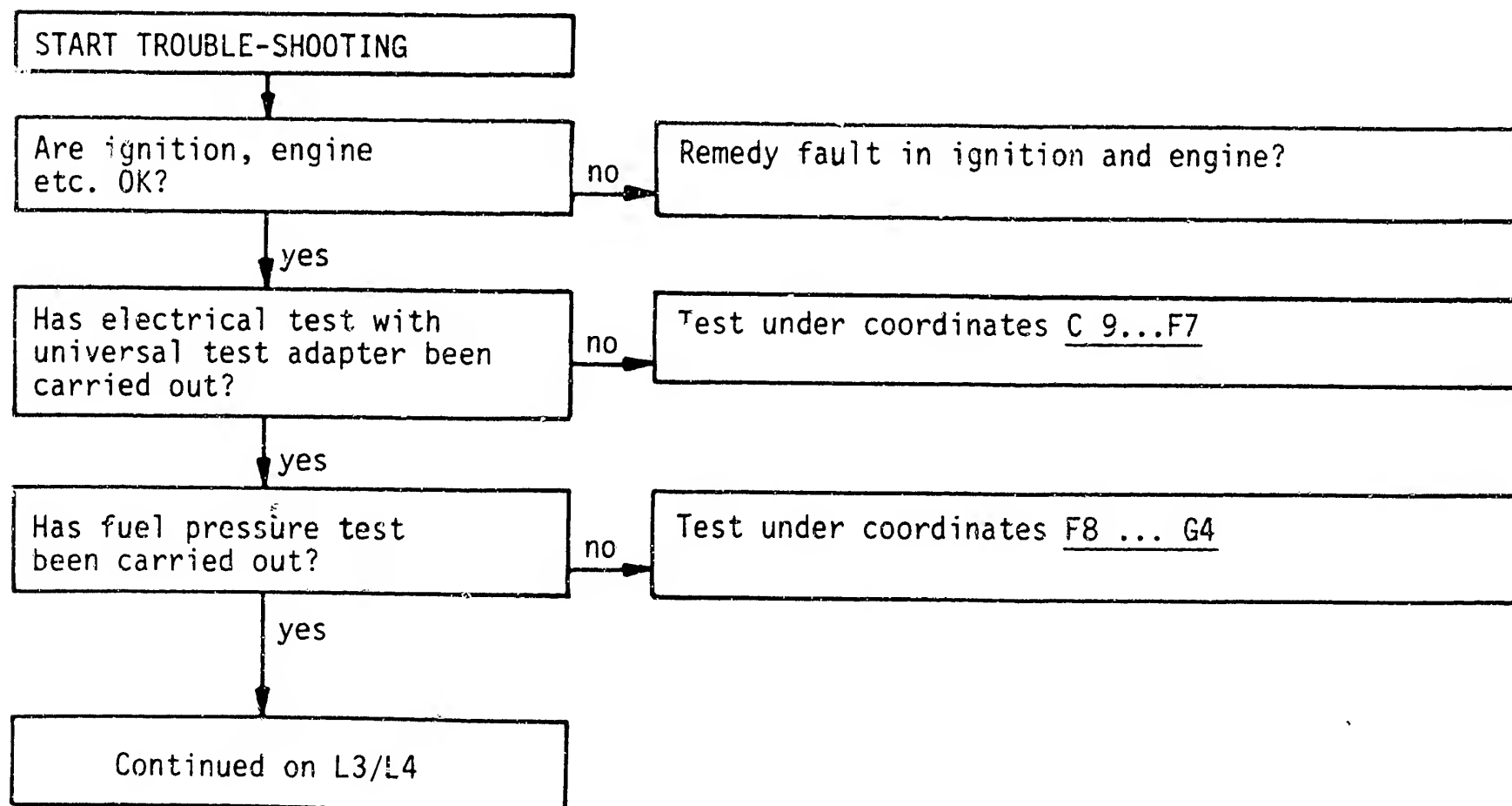
Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.

If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



L1

Insufficient maximum power
SAAB 900 Turbo USA



L2

Insufficient maximum power
SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)

yes

Does throttle valve fully open?

- Are accelerator pedal, throttle linkage, and accelerator cable OK?

no

- Throttle linkage may stick due to floor mat.

- If accelerator cable kinked → replace.

yes

Is throttle valve closed?

- Does throttle-plate lever hit against stop screw?

no

Testing

Determine whether throttle valve can be closed further, with resultant drop in engine speed.

Throttle valve adjustment:

- Check whether throttle valve is centered in throttle-valve housing.
- Unscrew stop screw far enough so that there is no contact between stop screw and throttle-plate lever.

- Screw stop screw in far enough so that stop screw touches throttle-plate lever.

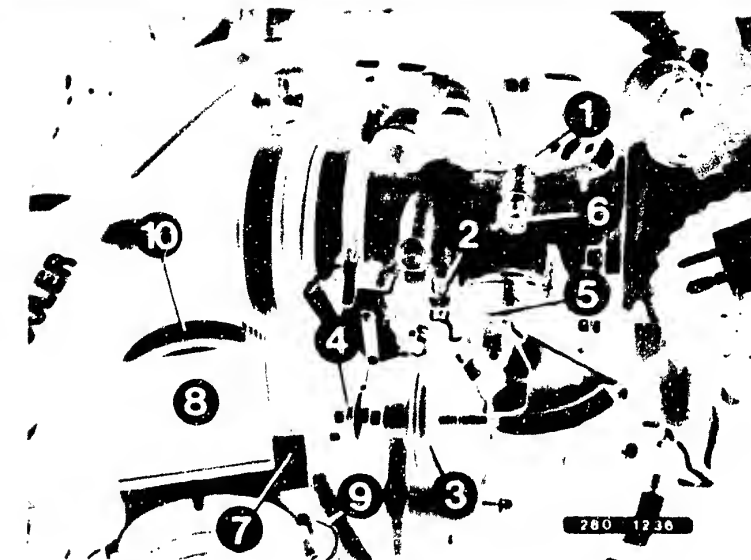
- Then screw in stop screw another 3/4 turn and lock stop screw with locknut. This results in a play between throttle valve and throttle-valve housing of approx. 0.05 mm.

Check accelerator cable length.

- Accelerator cable must be at least long enough so that throttle valve is in idle position.
- No play in accelerator cable.
- Throttle valve must be fully open when gas pedal is fully depressed.

yes

Continued on L5/L6



- 2 = Throttle-valve stop screw
- 3 = Throttle-valve damper
- 4 = Locknut for setting throttle-valve damper
- 5 = Throttle-plate lever

L3

Insufficient maximum power

SAAB 900 Turbo USA



L4

Insufficient maximum power

SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)

yes

is air filter clean?

no

Open retaining clamp on air filter and replace air filter.

yes

Is throttle-valve switch OK?

- Does injection pulse length change during idle when term. 3 and term. 18 are bridged (full-load enrichment)?

no

Connect test lead as follows:
One terminal of test lead is connected between one solenoid-operated injection valve and its connecting cables. Of the two other terminals, only one terminal may be connected with the motortester special input.

Caution!

The other terminal must not come into contact with vehicle ground!

- If connection is correct, the image on the right will be visible on the oscilloscope. With the help of the test lead, the injection pulses can be checked at the injection valves with an ignition oscilloscope while engine is running.

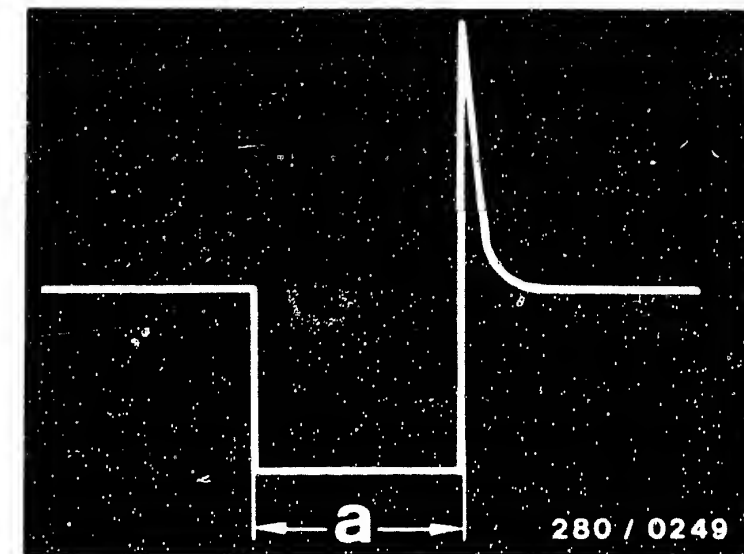
- Testing full-load enrichment:
Observe injection pulses during idling. Remove throttle-valve connector and bridge term. 3 and term. 18 (insulated wire bridge).
Caution! Do not bend any plug lugs.
Injection pulse should become longer, or in voltage measurement on an injection valve → voltage must rise approx. 0.1 V upon bridging. If not → replace control unit.

Note!

After testing, restore to original installed condition.

yes

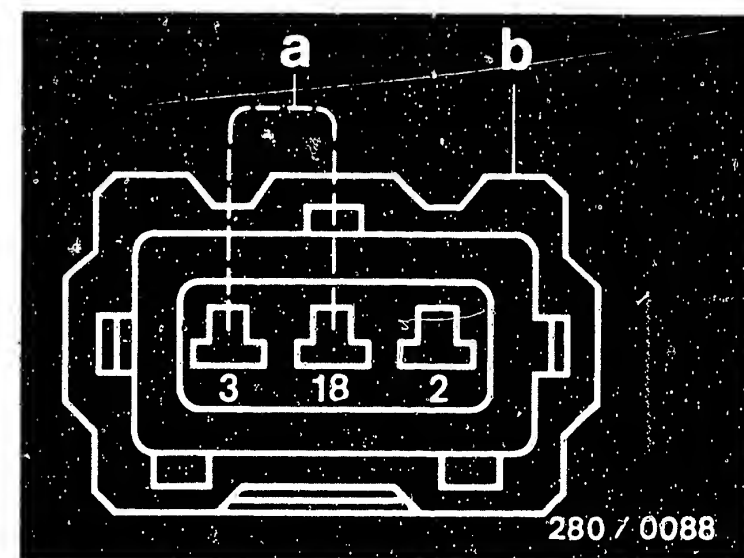
Continued on L7/L8



Injection pulse of a switched output stage (measured at solenoid-operated injection valve)

a = Impulse length
(dependent on engine load)

a = Wire bridge (insulated)
b = Throttle-valve switch
(-connector)



L5

Insufficient maximum power

SAAB 900 Turbo USA



L6

Insufficient maximum power

SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)

Fuel delivery of electric fuel pump OK?

Test specification:

at least 900 cm³/30sec

no

- Measuring fuel delivery:
For testing, undo junction between fuel return hose (at pressure regulator) and fuel return line (to fuel tank).
- Bridge safety circuit
 - Remove pump fuse no. 30
 - Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal at both ends)
 - Connect auxiliary lead between fuses no. 30 and no. 29.
 - Read fuel pressure on pressure gauge.
- Fuel pressure test specification
2.3...2.7 bar

Note!

After testing has been completed, auxiliary lead must be removed and plug connection restored to original state.

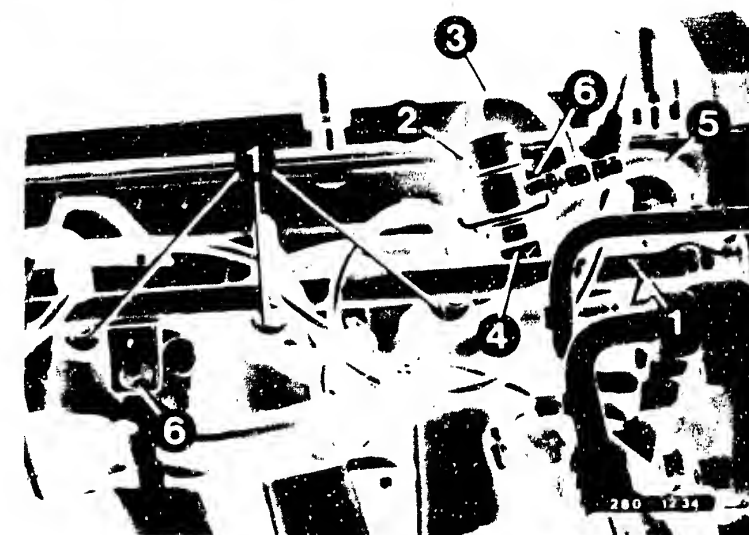
Remedy, if test specification not reached:

- Fuel filter clogged → replace.
- Voltage at fuel pump terminals with engine running: at least 12 V. If not, clean contacts, if necessary remove poor ground connection, replace leads. Check pump fuse.
- Pressure regulator defective → replace.

yes

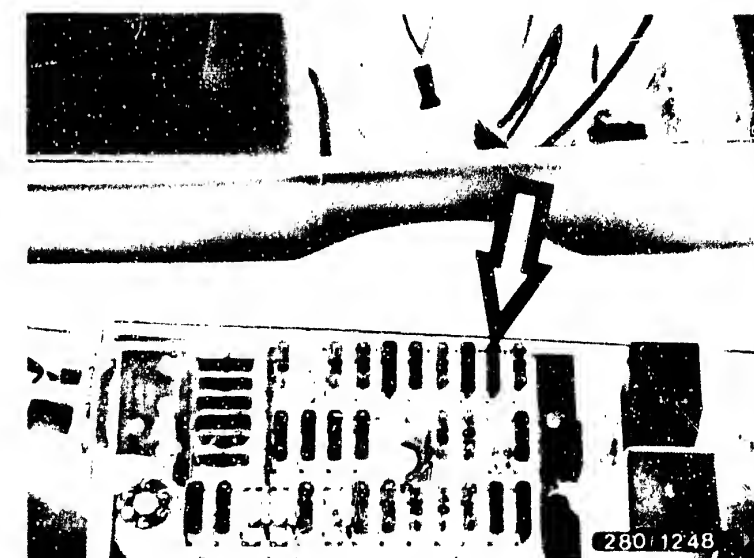
Continued on L9/L10

Continued on L9/L10



2 = Pressure regulator
3 = Intake manifold connection
4 = Fuel return line

Arrow = Pump fuse



L7

Insufficient maximum power
SAAB 900 Turbo USA



L8

Insufficient maximum power
SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (Continued)

- Electric fuel pump performance insufficient → replace electric fuel pump.
Testing ended: plug in control unit.
Unplug auxiliary lead and reinsert pump fuse (original installed condition).
Reconnect fuel lines to pressure regulator and check junctions for leakage.

yes

Exhaust turbo-supercharger or charge-air pressure setting for knock control (APC system) OK?

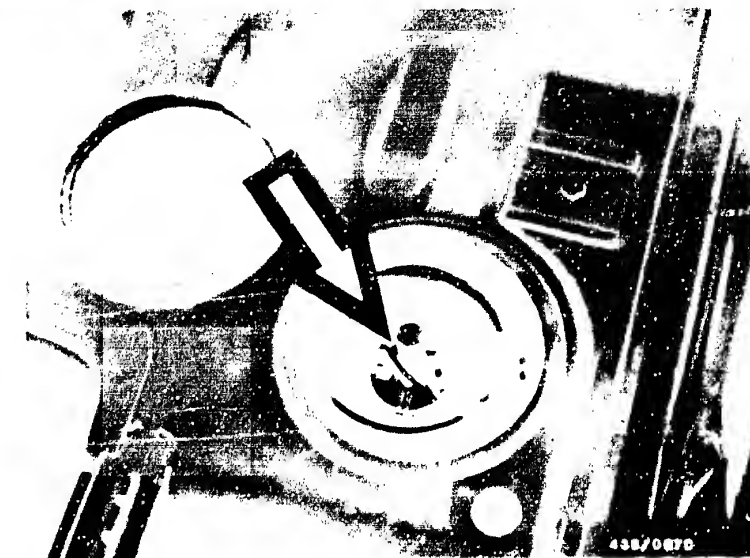
no

- Testing charge-air pressure control valve basic setting (basic charge-air pressure) on the street
 - Engine at operating temperature.
 - Connect pressure-measuring device (pressure gauge 0...1.6 bar, Wika Co. no. 4184).
 - Arrange pressure gauge in passenger compartment vertically so that it can be read. Run connection hose into engine compartment and connect between connection on intake manifold and hose in passenger compartment.
 - Unplug connector on solenoid-operated valve (near ignition coil).
 - Manual transmission:
In 3rd gear, drive with an engine speed of less than 1500 min⁻¹.
 - Automatic transmission:
Drive in position 1 with an engine speed of less than 1500 min⁻¹.
 - Accelerate at full throttle.

yes

Continued on L13/L14

Continued on L11/L12



Arrow = In-tank electric fuel pump

L9

Insufficient maximum power
SAAB 900 Turbo USA



L10

Insufficient maximum power
SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)

yes

Continued on L13/L14

- When engine speed approaches 3000 min⁻¹, brake vehicle with fully-depressed throttle pedal, so that basic charge-air pressure has the following value: set value 0.32...0.38 bar
Caution!
The engine must be fully warmed up.
 - When measuring the charge-air pressure while driving, the check must be carried out as quickly as possible (approx. 3...5 sec.), in order to avoid excessive brake-lining temperatures.
 - Between the individual measurements and at the end of measuring, drive the vehicle at least 1 km, so that the brake linings can cool off. The basic charge-air pressure is solely a basic value for the operation of the APC system, and has no direct influence on the charge-air pressure level.
An increase in basic charge-air pressure above 0.35 + 0.03 bar effects no improved engine performance
- The maximum charge-air pressure, which brings about the correct performance in the engine, is controlled by knock control.
- Plug connector onto solenoid-operated valve.
 - Checking charge-air pressure
 - Engine at operating temperature.
 - Charge-air pressure must climb between 0.7 ... 0.8 bar at full load.
- If both test specifications are not reached, inspect exhaust turbo-supercharger and knock control (APC system).

L11

Insufficient maximum power
SAAB 900 Turbo USA



L12

Insufficient maximum power
SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

• Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

• Electrical test

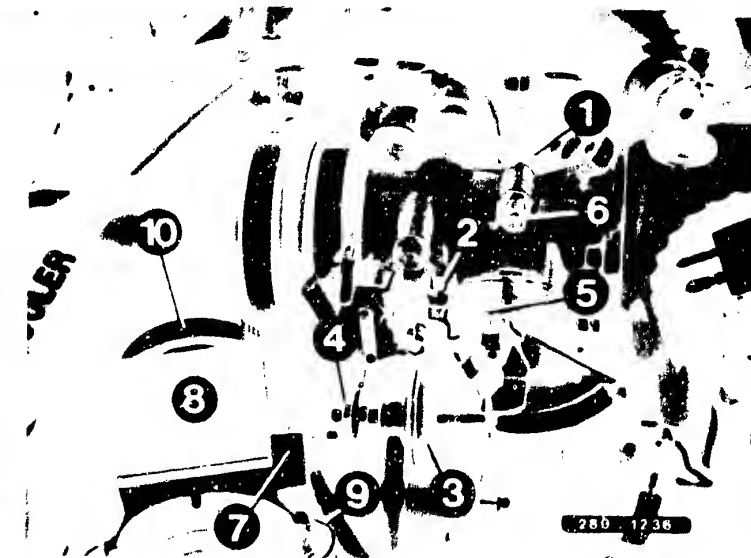
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0 ... 1100 Ω
between term. 5 and term. 3: 3.6 ... 4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

Continued on L15/L16



- 7 = Potentiometer for idle-mixture adjustment
8 = Hot-wire air-mass sensor
9 = Clamp fasteners
10 = Hose bands

L13

Insufficient maximum power
SAAB 900 Turbo USA

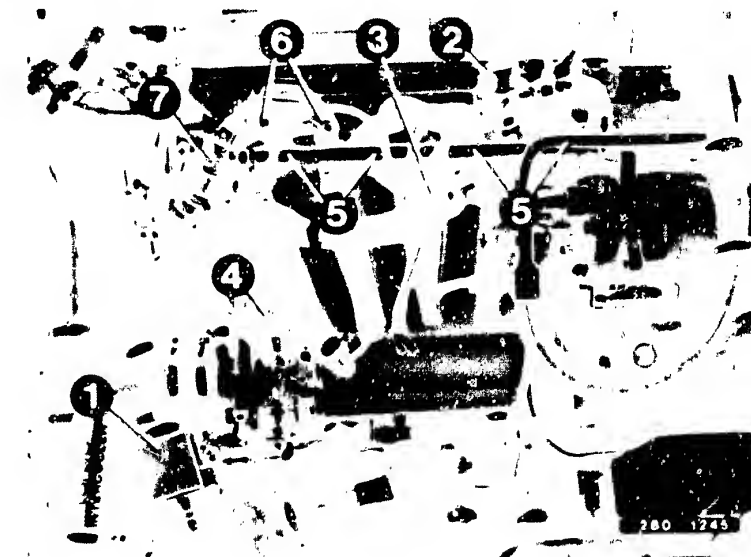
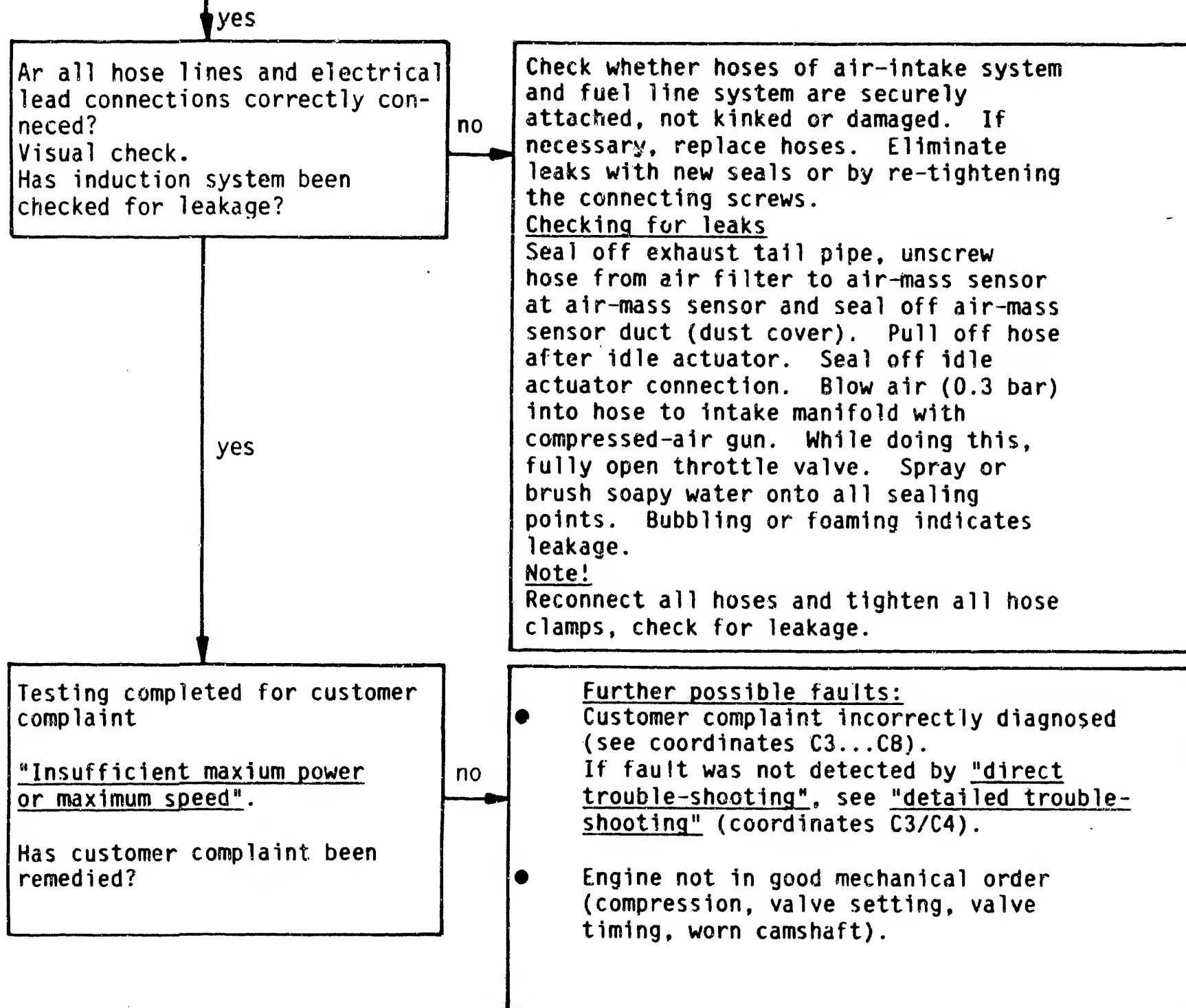


L14

Insufficient maximum power
SAAB 900 Turbo USA



Insufficient maximum power or maximum speed (continued)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II (engine)
- 4 = Throttle-valve switch
- 5 = Solenoid-operated injection valve
- 6 = Ground terminals
- 7 = Idle actuator

L15

Insufficient maximum power
SAAB 900 Turbo USA



L16

Insufficient maximum power
SAAB 900 Turbo USA



CO ADJUSTMENT AT IDLE TOO LOW OR TOO HIGH

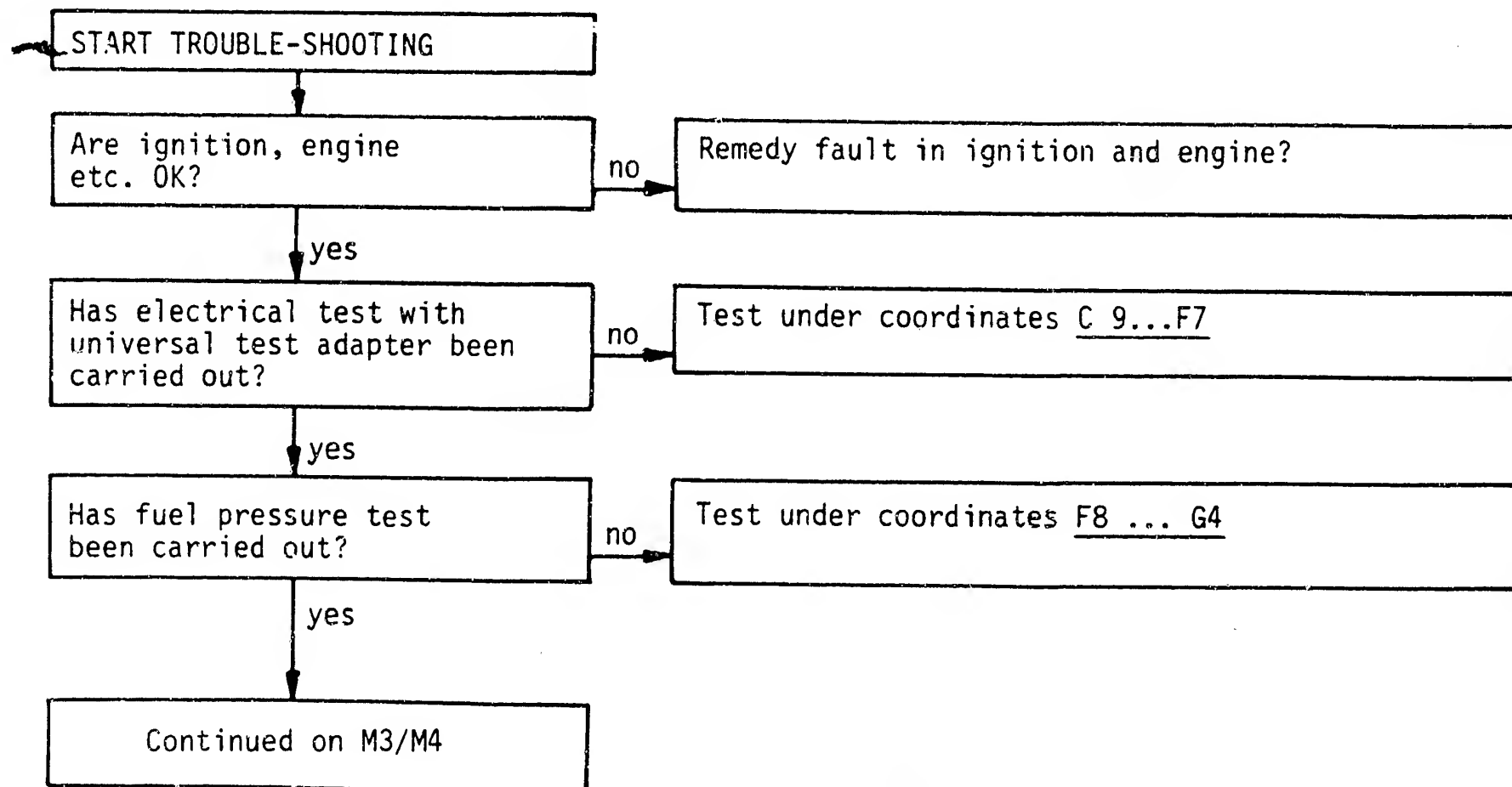
Trouble-shooting program according to customer complaint

Instructions for use

The program is divided into 3 rows of boxes:

- In the left row are questions for continuous testing
- In the middle row component tests and adjustments are described.
- The right row contains illustrations belonging to the text, and explanations of illustration positions.

If the questions can be answered with a clear "yes" without testing, continue to the following question.
If, however, the question is answered with a "no" and a fault is suspected, branch to the middle row of boxes and carry out the test listed there. At the end of testing continue trouble-shooting at the point where you branched off.



M1

Idle speed and CO adjustment
SAAB 900 Turbo USA



M2

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Idle actuator in good mechanical condition?

no

- Idle actuator is tested electrically and for functioning with the universal test adapter.
- Mechanical test
Idle actuator is tested for freedom of movement as follows:
 - Remove idle actuator (pull off hoses).
 - Remove plug.
 - Connect middle connection (term. 2) to battery voltage.
 - Connect outer connection (term. 1) to ground.
 - Ascertain by visual check whether rotary spool turns to end stop.
 - Change outer connection, i.e. connect term. 3 to ground. Rotary spool must now turn to opposite stop.Exchange defective idle actuator.
When installing idle actuator observe flow-through direction (arrow).

yes

Continued on M5/M6



4 = Idle actuator

M3

Idle speed and CO adjustment
SAAB 900 Turbo USA



M4

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Start control OK?
(Control unit function)

- Connect test lead between a solenoid-operated injection valve
- Remove plug from temperature sensor 2 to engine.
(Blue plug)
- Connect motortester or multitester to test lead
(position V, measuring range 10 V).
- Remove pump fuse no. 30.
- Apply ignition lead term. 4 from ignition distributor to ground via a spark gap.

Start engine.
Does voltage at solenoid-operated injection valve fall from initial of greater than 2 V to approx. 0.5 V during starting?
(if engine is at operating temperature or NTC II plug is plugged in, voltage is less than 0.5 V).

After testing restore to original installed state.

yes

Continued on M5/M6

no

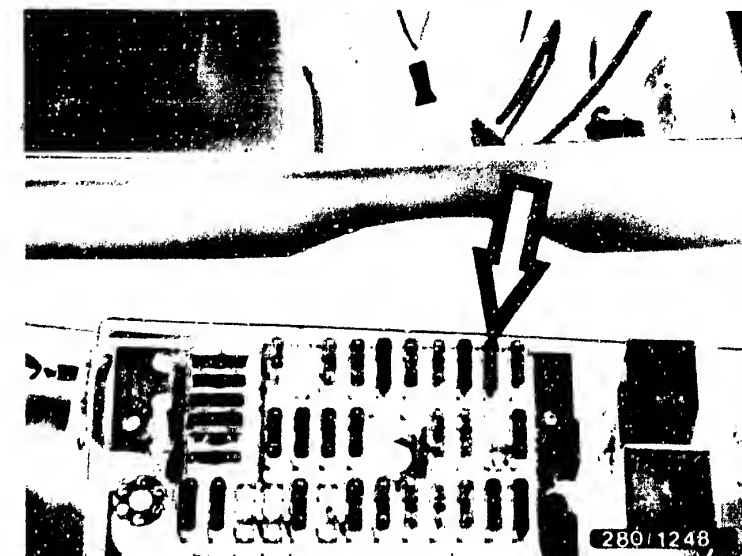
Functional test

- Remove pump fuse no. 30 (in central fuse box on left fender).
- Remove ignition lead term. 4 from ignition distributor cap and connect to vehicle ground with spark gap.
(Careful! Engine must not start).

Careful!

When using a spark gap EF 1177/7 1 684 531 000, an interference-suppression resistor of at least 2 k Ω , e.g. sleeve-type suppressor (5 k Ω) 0 356 500 001, must be connected between spark gap and ignition coil term. 4, in order to prevent destruction of the control unit.

Continued on M7/M8



Arrow = Pump fuse

1 = Ignition coil condensor tester
EFAW 106 A
0 681 100 001

2 = Sleeve-type suppressor 5k Ω

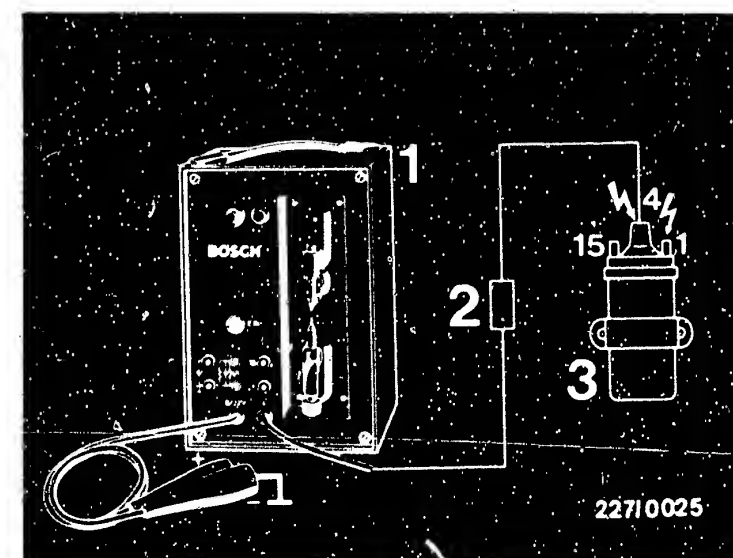
3 = Ignition coil

Caution!

Hazardous voltages

400 V - 25 kV)

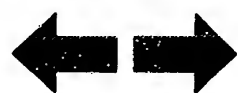
at term. 1 and term. 4



M5

Idle speed and CO adjustment

SAAB 900 Turbo USA



M6

Idle speed and CO adjustment

SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

- Connect 2-pin adapter lead 1 684 463 093 between a solenoid-operated injection valve and its electrical connection lead.
- Connect multimeter or motortester to free measuring pin. Measuring range approx. 10 V.
- Pull cable plug from temperature sensor II (engine) (blue plug).

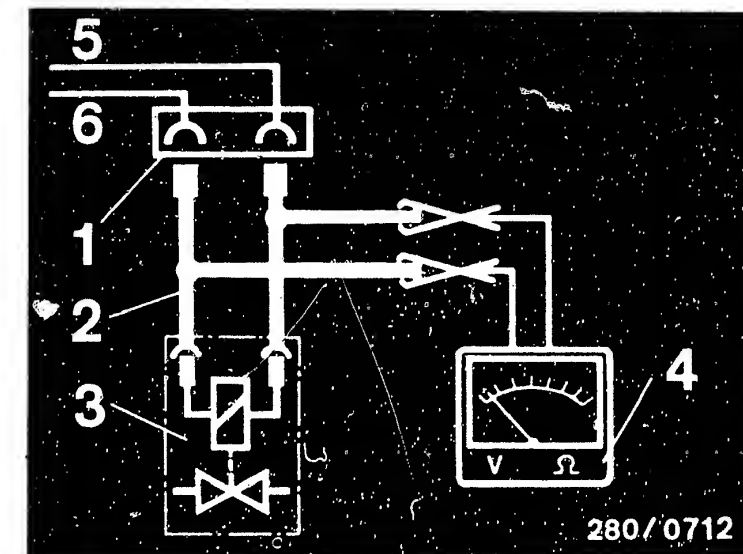
Measurement:

- Start engine
- Voltage reading falls from initial of greater than 2V within approx. 15 sec start time to approx. 0.5 V.
If voltage not attained → replace control unit.
- Voltage test can be repeated only after approx. 1 min.
- Plug cable plug to temperature sensor.
If engine at operating temperature, start → voltage reading less than 0.5 V.
If not → replace temperature sensor II.

Careful!

After testing, restore to original installed state.

Continued on M9/M10



- 1 = Solenoid-operated injection valve lead connection plug
- 2 = Test lead 1 684 463 093
- 3 = Injection valve
- 4 = Multimeter or motortester
- 5 = From pump relay term. 87
- 6 = From control unit term. 13

- 1 = Temperature sensor II (Engine) on engine block (blue plug)



M7

Idle speed and CO adjustment
SAAB 900 Turbo USA



M8

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Solenoid-operated injection valve sealing OK?

no

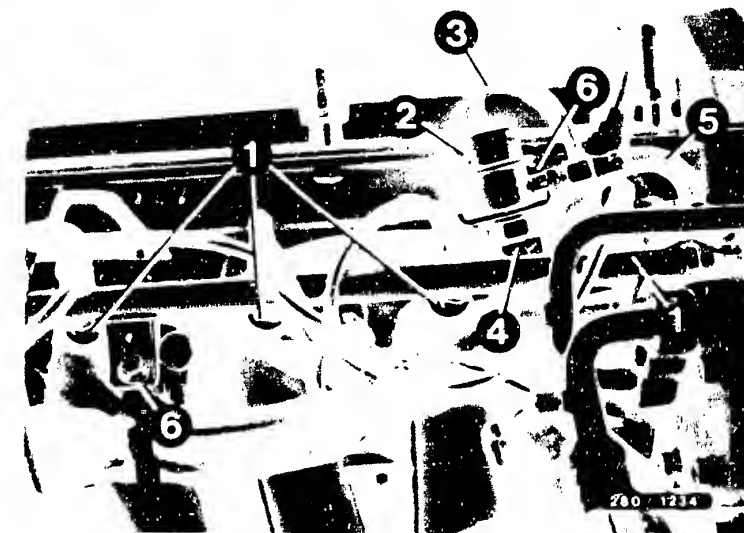
yes

Continued on M13/M14

Checking sealing of solenoid-operated injection valves:

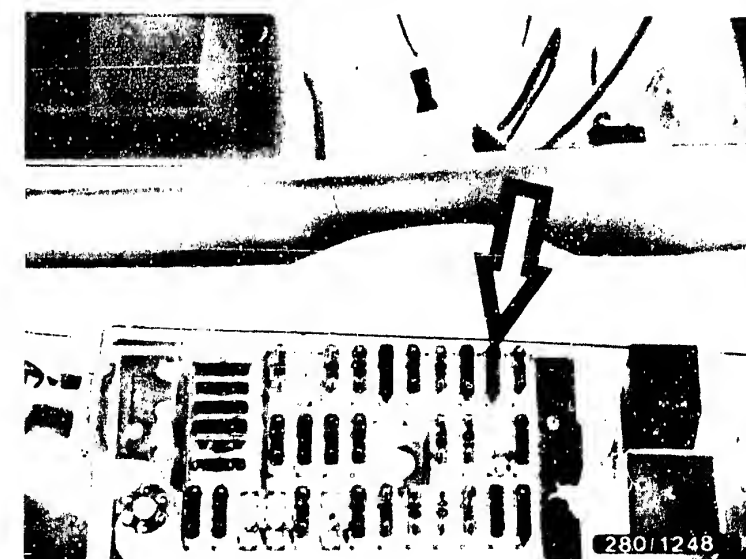
- Remove fuel-distribution pipe with injection valve:
 - Loosen fastening screws on fuel-distribution pipe and pressure regulator.
 - Pull all 4 injection valves out of the cylinder head simultaneously and carefully.
- Build up fuel pressure:
 - Bridge safety circuit
 - Pull out pump fuse no. 30.
 - Make auxiliary lead (1.5 mm dia. lead with 6.3 mm blade terminal at each end)
 - Connect auxiliary lead between fuses no. 30 and no. 29.
 - In-tank electric fuel pump should operate.
- Test specification:
Within 60 sec. there must be no drop formation at the mouth of the solenoid-operated injection valve.
In case of fault, exchange injection valve.
- Removal
Remove electrical connection.
 - Carefully push holding clamp out of groove.
 - Carefully pull injection valve out of fuel-distribution pipe.

Caution! Catch any fuel running out. Do not allow to drop onto hot engine parts.



1 = Injection valves
6 = Fastening screws

Arrow = Pump fuse



M9

Idle speed and CO adjustment
SAAB 900 Turbo USA



M10

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

• Installation

Careful!

Before installation, both O-rings may be greased only lightly (silicone grease Ft 2 v 1).

The remaining solenoid-injection valve parts must stay grease-free.

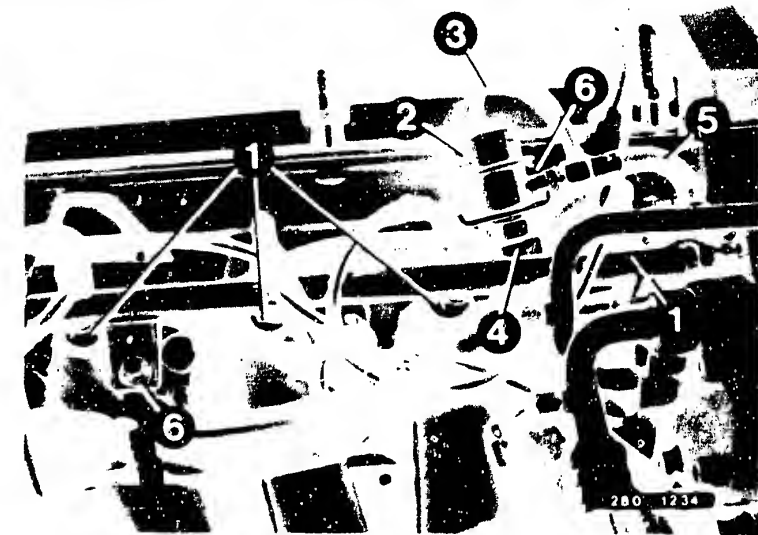
- Carefully plug new solenoid-operated injection valve into fuel-distribution pipe.
- Push holding clamp into groove on injection valve until clamp engages. (Check connection point for leakage).

Note!

After testing, restore to original installed condition. Check for leaks (extraneous air).

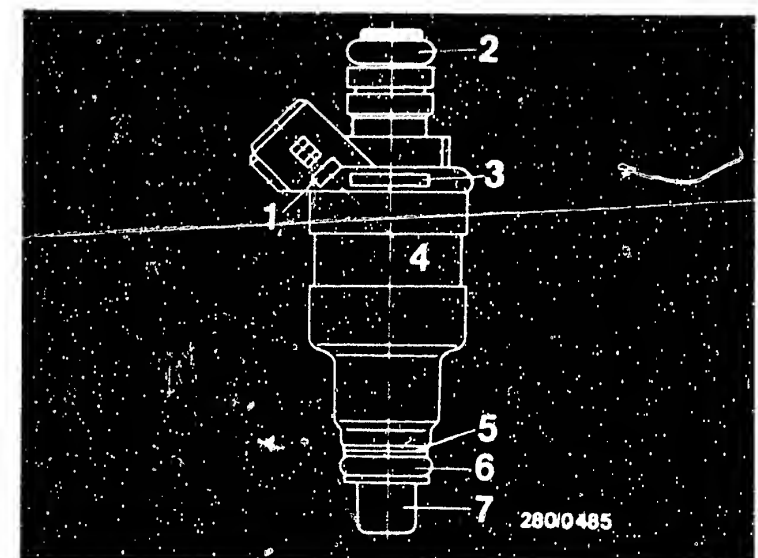
yes

Continued on M13/M14



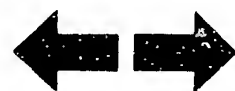
1 = Solenoid valves
6 = Fastening screws

1 = FD marking
2 = Upper O-ring
3 = Part number
4 = Injection valve
5 = Supporting plate
(yellow 2 mm)
6 = Lower O-ring
7 = Protection sleeve



M11

Idle speed and CO adjustment
SAAB 900 Turbo USA



M12

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Is hot-wire air-mass sensor in good mechanical and electrical order?

- Hot wire not broken?
- Resistance value inside tolerance?

Between term. 6 and term. 3:

0 ... 1100 Ω

Between term. 5 and term. 3:

3.6 ... 4.1 Ω

no

Removal

- Loosen both clamp fasteners on air-filter side.
- Loosen hose band on other side of hot-wire air-mass sensor.
- Remove hot-wire air-mass sensor.

Testing

Visual test

- Connection correctly plugged, spring clamp snapped in, plug not twisted, no plug lugs pushed back or with poor contact. Check for correct seating of sealing in connector.
- Wire screen on both sides OK?
- Hot wire broken? If so, replace hot-wire air-mass sensor.

Electrical test

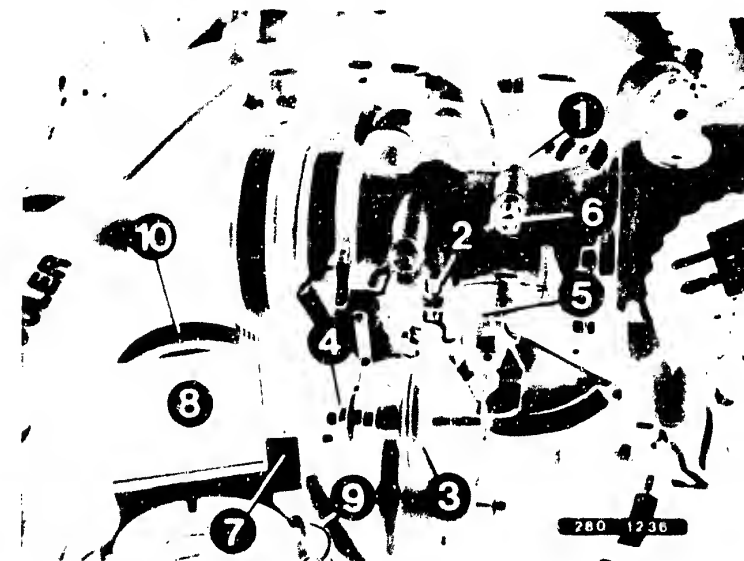
- Remove connector plug. Set multimeter or motortester to Ω range.
Resistance measurement
between term. 6 and term. 3: 0...1100 Ω
between term. 5 and term. 3: 3.6...4.1 Ω
If deviation, exchange hot-wire air-mass sensor.

Installation

- Plug in connector correctly (good contact).
- Fasten clamp fasteners.
- Connect wire and tighten wire clamps on hot-wire air-mass sensor (ensure good connection sealing - extraneous air!).

yes

Continued on M15/M16



- 7 = Potentiometer for idle-mixture adjustment
- 8 = Hot-wire air-mass sensor
- 9 = Clamp fasteners
- 10 = Hose bands

M13

Idle speed and CO adjustment
SAAB 900 Turbo USA



M14

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Has suction system been
checked for leakage?

nc

Checking for leaks

Seal off exhaust tail pipe.

Unscrew hose from air filter to air-mass
sensor at air-mass sensor and seal off
air-mass sensor duct (dust cover).

Pull off hose after idle actuator.

Seal off idle actuator connection.

Blow air (0.3 bar) into hose to intake
manifold with compressed-air gun.

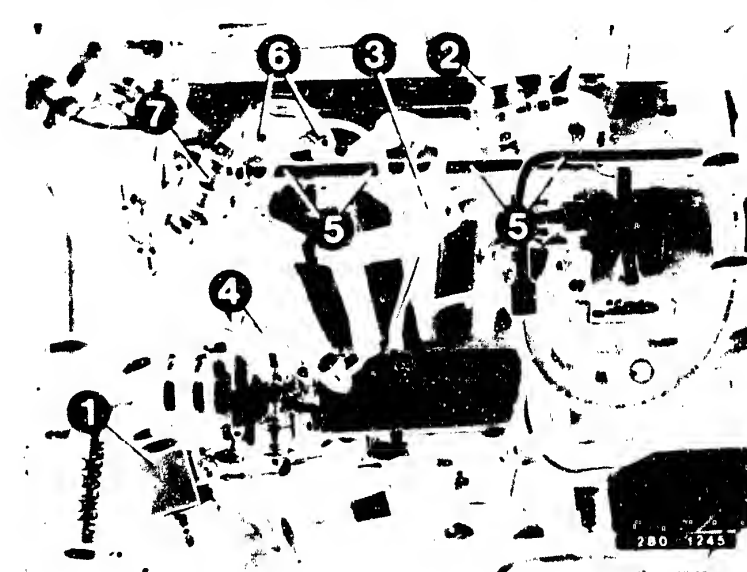
While doing this, fully open throttle valve.
Spray or brush soapy water onto all sealing
points. Bubbling or foaming indicates
leakage.

Note!

Reconnect all hoses and tighten hose clamps.
Check for leakage.

yes

Continued on M17/M18



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Temperature sensor II
(Engine)
- 4 = Throttle-valve switch
- 5 = Solenoid-operated injection
valves
- 6 = Ground terminals
- 7 = Idle actuator

M15

Idle speed and CO adjustment
SAAB 900 Turbo USA



M16

Idle speed and CO adjustment
SAAB 900 Turbo USA



CO adjustment at idle too low or too high (continued)

yes

Idle speed and integrator voltage (CO content) not adjustable? Repeat.

no

yes

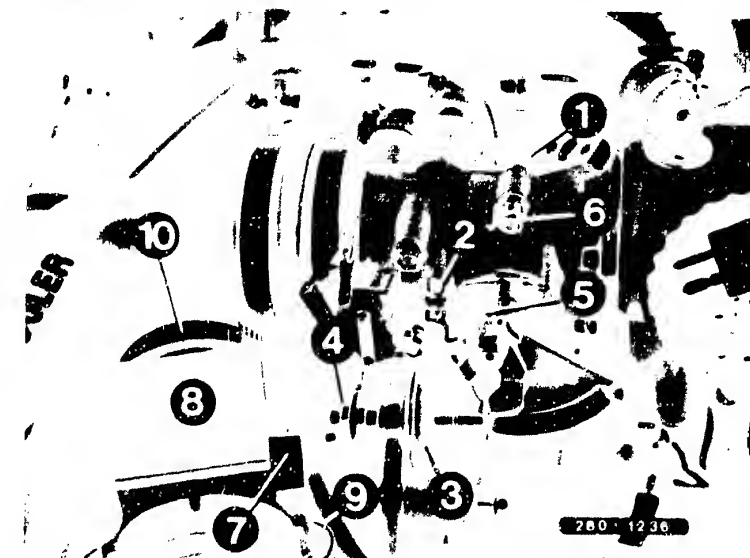
Testing completed for customer complaint

"CO adjustment at idle too low or too high"

Further possible faults:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates C3/C4).
- Engine not in good mechanical order (compression, valve setting, valve timing, worn camshaft).

- Idle speed
(Switch on low beams).
Manual and automatic transmission
(selector lever in position "P"):
775...925 min⁻¹
- Integrator voltage
The CO content in exhaust gas is indirectly adjusted via the integrator voltage of the lambda closed-loop control. During adjustment with the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, the anti-tamper device must be drilled out (use suitable commercially available tools), and after testing a new lead seal must be inserted (1 283 123 004). Adjustment must be undertaken in small steps (hexagon-socket-head capscrew SW5), and the voltage reader must always be checked afterwards :
 - Connect voltmeter (R_i at least 20kΩ/V) between ground and integrator output (measuring range 15V)
 - Testing:
With correct adjustment and engine running at operating temperature, the reading should oscillate back and forth between 0...13 V (control).
 - If fault:
Adjust control range with the potentiometer for idle-mixture adjustment.
 - Reading approx. 0 V:
Turn potentiometer to the right.
 - Reading approx. 13 V:
Turn potentiometer to the left.



- 6 = Idle-speed-adjusting screw
7 = Potentiometer for idle-mixture adjustment



Technical Bulletin

Only for use within the Bosch organization. No to be communicated to any third party.

28

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 464 ..

VDI-I-280/107 En

9.1984

(Supersedes Ed. 3.1983)

Electric fuel pump	Parts set (non-ret. valve and seal ring)	Non-return valve	Seal
0 580 364 002	---	1 583 386 011	1 580 203 001
0 580 464 005	---	008	001
006	---	008	001
007	---	008	001
009	---	008	001
010	---	008	001
017	1 587 010 002		
018	007		
021	006		
022	007		
024	006		
025	007		
027	006		
028	006		
029	1 587 010 506		
030	006		
031	005		
1 580 464 997	006		

Please direct questions and comments concerning the contents to our authorized representative in your country.

N1

Technical Bulletin

SAAB 900 Turbo USA



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

DETERMINATION OF THE TEMPERATURE VALUES
GIVEN IN L-JETRONIC MANUALS

VDT-I-280/108 En
5.1982

We have recently been asked with increasing regularity how accurately the engine temperature must be measured when trouble-shooting on the vehicle.

So far in its L-Jetronic manuals KH/VSK has given three or four different temperatures for testing the temperature sensor:

-10 °C, +20 °C, +40 °C and +80 °C,

and two ranges for the thermo-time switch e.g. 35 °C 8 sec.

below +30 °C and above +40 °C.

Since the temperature range need not be subject to such close tolerances, we propose in future the following more appropriate definition:

- Ambient temperature (approx. +15 °C to +30 °C)
- Engine at normal operating temperature (approx. +80 °C).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausstattung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N2

Technical Bulletin

SAAB 900 Turbo USA



After-sales Service

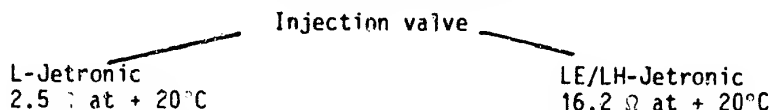
Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

CODING OF LE/LH-JETRONIC
SOLENOID-OPERATED INJECTION VALVES

VDT-I-280/109 En
5.1982

With the introduction of the LE/LH-Jetronic the internal resistance of the solenoid-operated injection valves has also been changed.



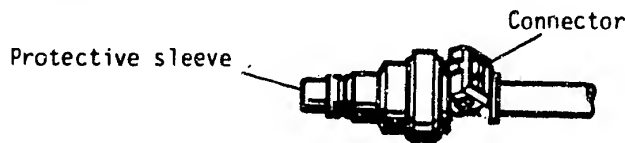
The connector has been left the same for cost reasons and to meet customer wishes.

Caution!

If L-Jetronic injection valves are installed in an LE/LH-Jetronic vehicle, either the control unit or the injection valves will suffer irreparable damage.

Note:

- Install only injection valves with the part number designated for the vehicle.
- As a guide, injection valves with 16.2 Ω internal resistance have a yellow protective sleeve.



- A colour coding (yellow) of the connector (see also VDT-I-280/5) is not generally intended for LE/LH-Jetronic injection valves.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1, Postfach 20 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N3

Technical Bulletin

SAAB 900 Turbo USA



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

28

VDT-I-280/110 En

6.1983

PARTS SET FOR INJECTION VALVES

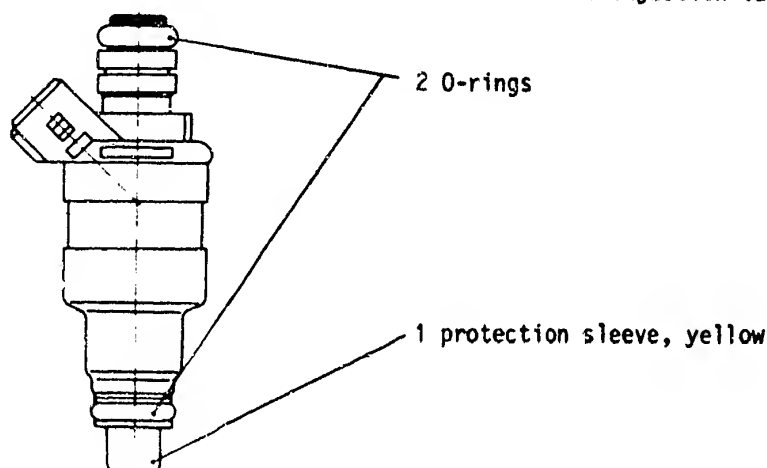
Supersedes 6.1982 edition

O 280 150 2..

AND PRESSURE REGULATORS O 280 160 2..

A common parts set is available for the L-Jetronic/LE-Jetronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for 1 pressure regulator:
1 O-ring
1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under O 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

Geschäftsbereich KM Kundendienst Kfz Auszubildung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N4

Technical Bulletin

SAAB 900 Turbo USA



Technical Bulletin

Only for use within the Bosch organization. No to be communicated to any third party.

28

PLUG CONNECTORS FOR
JETRONIC COMPONENTS
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...*.

* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
--------------------------------------	--------------

N5

Technical Bulletin

SAAB 900 Turbo USA



- Socket, black, 3-pin,
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- Socket, black, 5-pin,
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. ..
(LE version)

- Socket, black, 6-pin,
parts set 1 287 013 004 for

Air-flow sensor 0 280 200 ..

- Socket, black, 7-pin,
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..
Air-mass sensor 0 280 211 ..

- Wiring-harness plug connector, black, 25-pin
parts set 1 287 013 009 for:

Control unit 0 280 0..

- Wiring-harness plug connector, black, 35-pin,
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.



After-sales Service

Technical Bulletin

Only for use within the Bosch Organization. Not to be communicated to any third party.

New Product

(Exhaust Turbo-Supercharger System)

28

VDT-I-280/3 En

3.1981

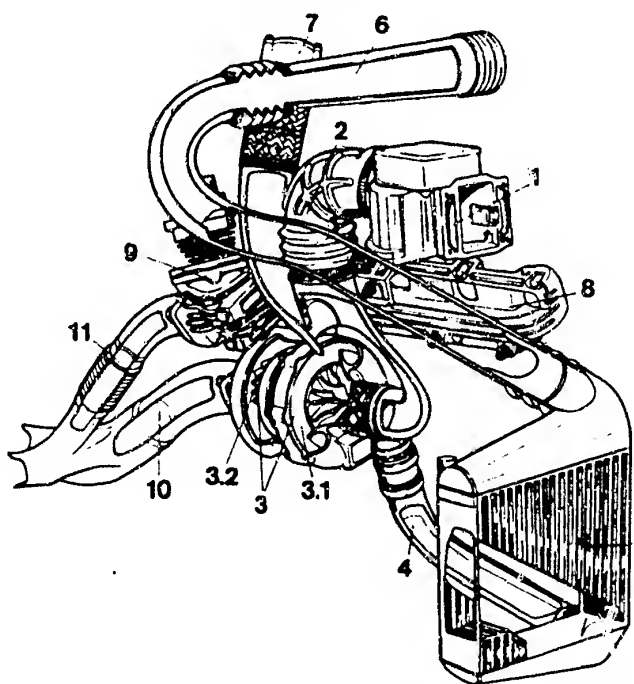
L-Jetronic with exhaust turbo-supercharger

As from September 1980, BMW have been delivering the 745i model equipped with L-Jetronic and an exhaust turbo-supercharger.

General:

The engine already in use in the 733i model, with L-Jetronic and a swept volume of 3.2 l, has been retained.

The intended increase in engine power has been achieved by fitting an exhaust turbo-supercharger specially adapted to this particular engine. The type designation 745i was chosen by BMW to signify this increase in power.



- 1 = Air-flow sensor meters the air drawn in
- 2 = Intake tube
- 3 = Exhaust turbo-supercharger, comprising the turbine (3.2) which is driven by the exhaust-gas stream, and the compressor (3.1) which is rigidly fixed to the turbine.
- 4 = Charge-air tube
- 5 = Charge-air cooler
- 6 = Charge-air intake connection
- 7 = Air-control valve for controlling the charge-air pressure during overrun
- 8 = Exhaust manifold
- 9 = Bypass valve
- 10 = Exhaust pipe
- 11 = Exhaust bypass duct

BOSCH

Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1 Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N7

Technical Bulletin

SAAB 900 Turbo USA



Functional description of the exhaust turbo-supercharger:

The turbine (3.2) is driven by the speed of the exhaust gas. The turbine and the compressor (3.1) are rigidly connected to one another. The air is drawn in by the compressor through an intake-noise damper (1) on the air filter and then through the air-flow sensor (2). Following the compressor, the compressed air is routed to the charge-air cooler (4). Here it is cooled down and then drawn into the individual cylinders of the engine through the charge-air intake connection, the throttle valve and the intake manifold (9).

Due to the fact that the charge-air pressure must not exceed approx. 0.7 bar, it has to be controlled. This is carried out by means of a bypass valve (6) at the exhaust manifold. The compressor and the bypass valve are joined by a control line (7). The turbine and the bypass valve are connected by a pipe to the exhaust system (8). As soon as the charge-air pressure becomes excessive, the bypass valve opens and permits a fraction of the exhaust gas to be diverted to the bypass duct of the exhaust system. As a result, the pressure applied to the turbine becomes less and the charge-air pressure sinks.

The compressor operates when the throttle valve is closed (and particularly during the actual closing process), this can lead to unwanted pressure shocks in the charge-air intake connection. These are prevented by the air-control valve (5). The air-control valve is connected to the intake manifold by a vacuum hose. The vacuum which is generated when the throttle valve closes opens the air-control valve and the charge air is diverted through the bypass line to the intake side of the compressor.

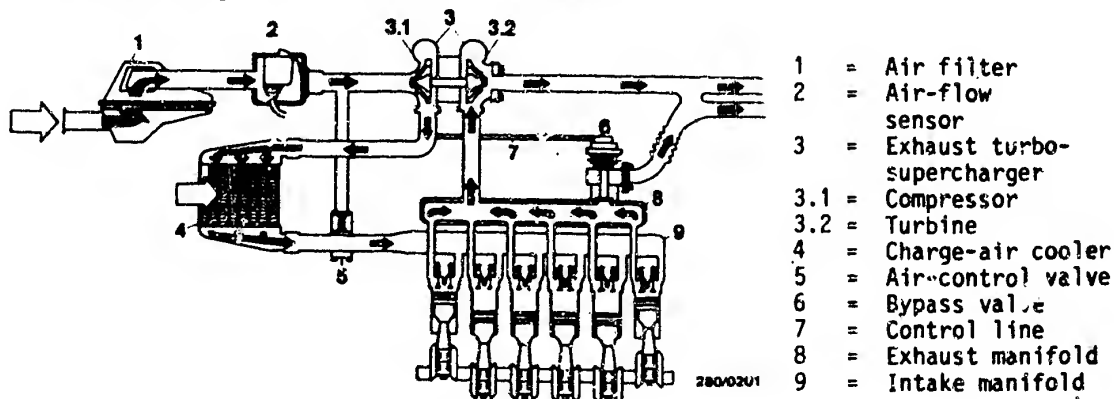
Functional description of the charge-air cooler:

When the intake air is compressed in the turbo-supercharger compressor its temperature increases considerably.

This increase in intake-air temperature has two disadvantages:

1. The density of the air drops along with the rise in temperature and, as a result, the cylinder charge as well.
2. The combustion-chamber temperature rises and with it the thermal loading of the engine.

These disadvantages are prevented by the charge-air cooler.



Differences in the fuel induction of this turbo-supercharged engine to that of the normally aspirated L-Jetronic engine

In order to increase the engine power, the following measures are necessary:

The metering range of the air-flow sensor has been extended by fitting a stronger counterspring at the sensor flap. The injected fuel quantity has been adapted to the increased intake-air quantity by raising the fuel primary pressure during pressure-charged operation and by increasing the cross-sectional area of the fuel-injection valves.

Three additional control-unit functions have been incorporated in the turbo-supercharged engine:

1. Engine-speed limitation is by means of injection-pulse switch-off instead of through the ignition-distributor rotor as is usually the case. The advantage of this method lies in the fact that in the switched off range no unburnt fuel can get into the exhaust system and, under certain conditions, burn there.
2. During overrun, with the throttle valve closed (idle contact in the throttle-valve switch closed) the supply of fuel is interrupted up to an engine speed of 1200 min^{-1} by switching-off the injection pulses to the fuel-injection valves.
3. A safety circuit stops the supply of fuel to the engine, in case of excessive turbo-supercharger pressure, by switching-off the fuel-injection valves.



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party

EXPORT VEHICLES WITH

EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.

12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	•	•	•	(•)	(•)
Secondary-air induction*	•	•	•	(•)	(•)
Secondary-air injection*	•	•	•	(•)	(•)
Catalytic converter*	-	-	-	•	•
Lambda closed-loop control	-	-	-	•	•

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

BOSCH

Geschäftsbereich KM Kundendienst Kfz-Ausstattung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

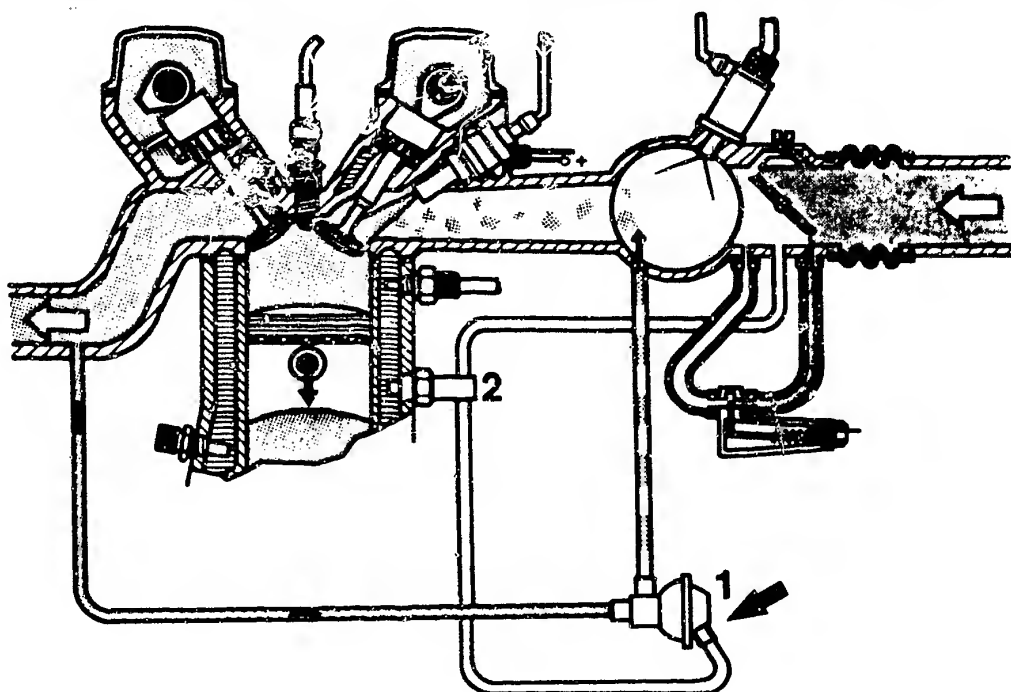
N10

Motor Vehicle Service Information

SAAB 900 Turbo USA



1. Exhaust-gas recirculation (EGR)



1 = Exhaust-gas recirculation valve

2 = Thermo-valve

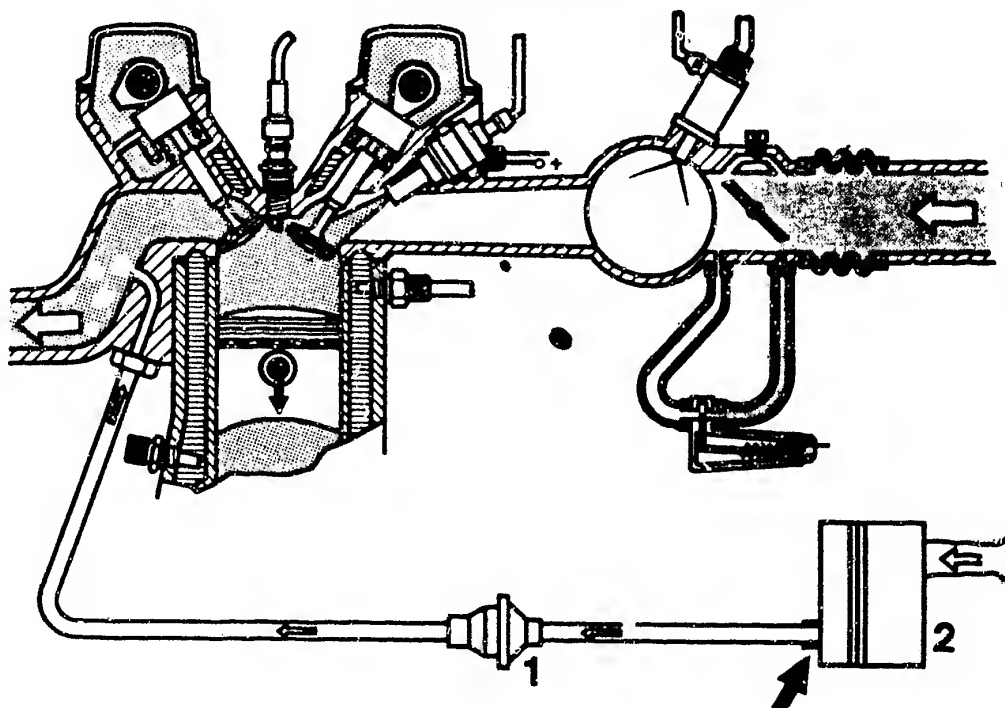
Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NO_x). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min⁻¹. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.



2. Secondary-air induction (e.g. Volvo Pulsair system)



1 = Non-return valve

2 = Air filter

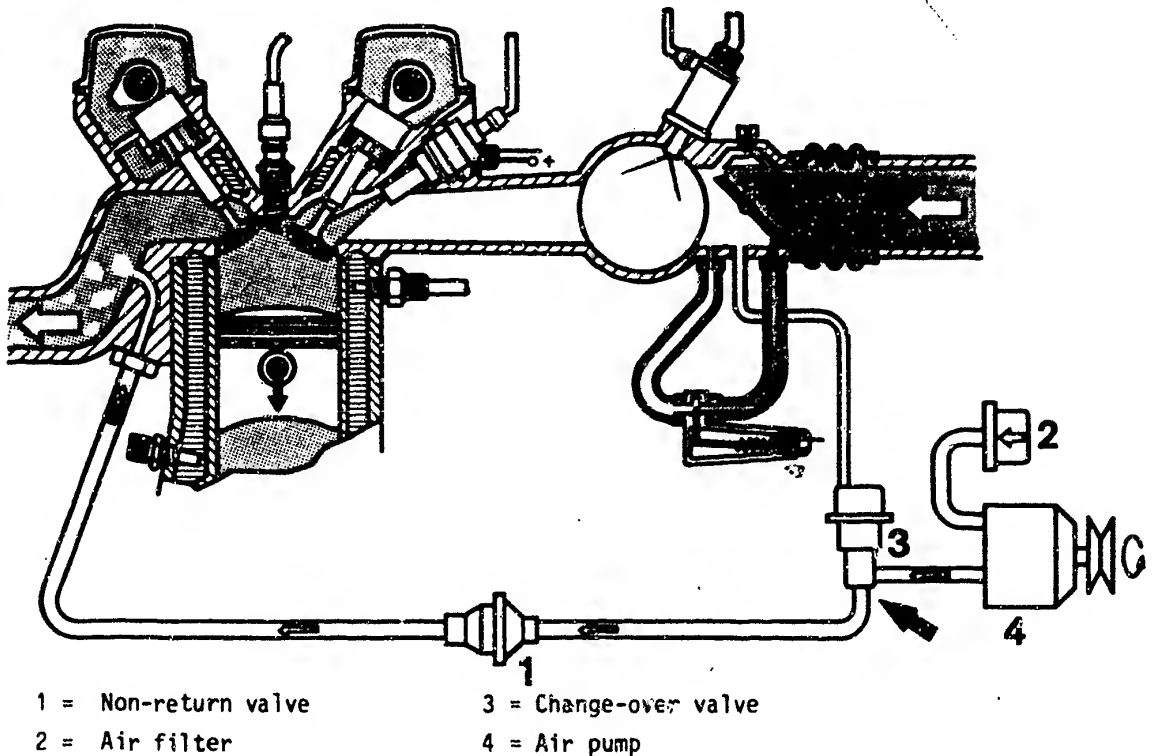
The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.



3. Secondary-air injection



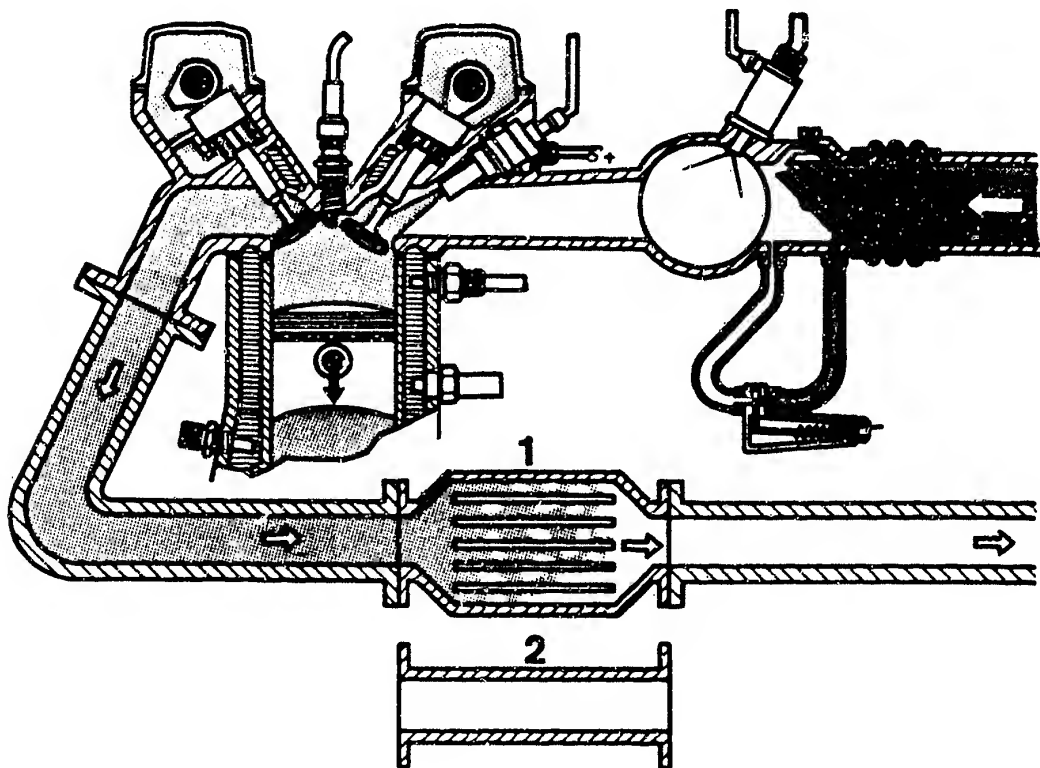
An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.



4. Catalytic converter



1 = Catalytic converter

2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.

Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

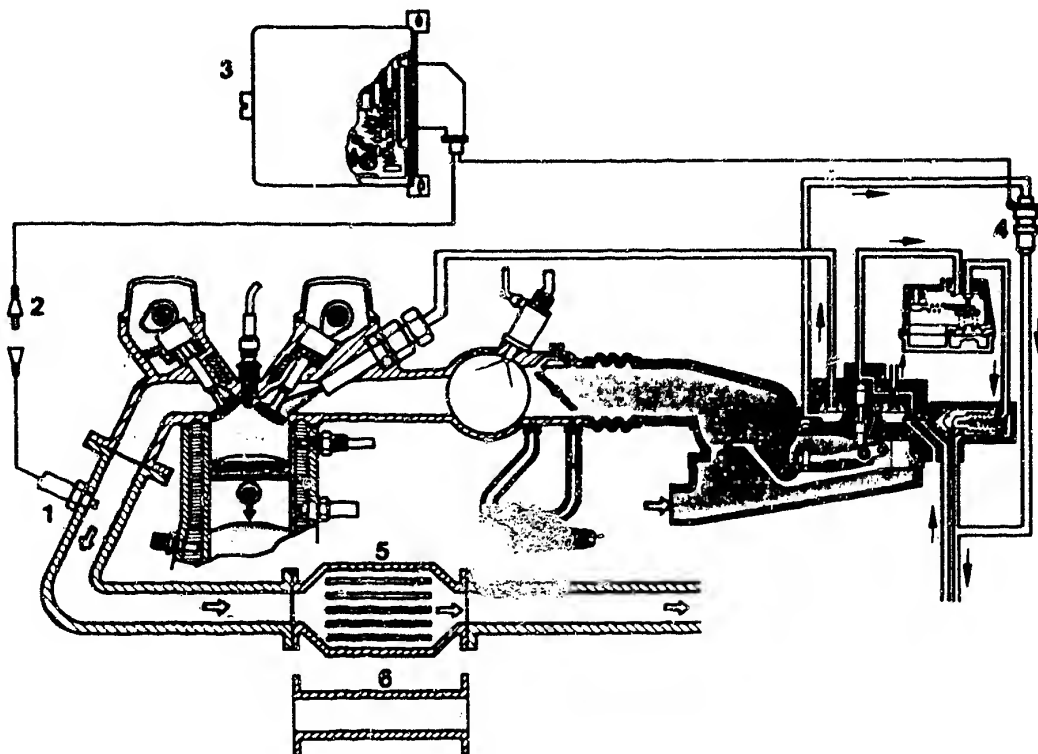
Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.



5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug

3 = Control unit
4 = Timing valve

5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.

If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!

Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.

The catalytic converter should be replaced by an intermediate pipe.

Published by:
Robert Bosch GmbH
Division KH
After-Sales Service Department
for Training and Technology
(KH/VSK)



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

COLD-START, WARM-UP AND
ACCELERATION PROBLEMS
in Jetronic-equipped vehicles

VDT-I-Gen. 051 En
10.1984
(Supersedes Ed. 10. 82)

Customer complaint

- Starting problems with cold engine
- Engine bucking during warm-up
- Rough idle (fluctuations in engine speed)
- Engine miss during acceleration (flat spot)
- Loss of power

Cause

If the ignition and the Jetronic have been checked, and the test specifications are being reached, coking of the intake valves might be the cause of the problems sited.

Oil carbon, with its sponge effect, delays the continuous movement of the fuel from the fuel-injection valve to the combustion chamber.

As a result, the air-fuel mixture sometimes becomes so lean that it is no longer certain to ignite.



The loss in power is due to a reduction of the cylinder charge, and is the result of extremely serious coking.

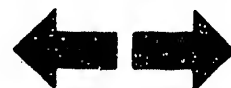
Complex relationships between properties specific to the engine, the engine oil used, and fuels, as well as the driving cycles can produce such coking on the intake valves.

Checking

If coking is suspected, we recommend checking the intake valves using an endoscope or a motoscope. Deposits on the valve head and/or shaft can be seen with these instruments and evaluated.

Corrective measures

Take out the coked intake valves and remove the deposits mechanically.



Additives

There are no reliable results yet available on the effectiveness of cleaning additives or fuel additives. The use of fuel additives can cause deposits in the fuel system and damage certain plastics and seals.

Please direct questions and comments concerning the contents to our authorized representative in your country.

N18

Motor Vehicle Service Information

SAAB 900 Turbo USA



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

BOSCH

Geschäftsbereich KM Kundendienst Kfz Ausrüstung
: by Robert Bosch GmbH D 7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N19

Motor Vehicle Service Information

SAAB 900 Turbo USA



TABLE OF CONTENTS

In the targeted trouble-shooting on a specific LH-Version component, it is absolutely necessary to select the pertinent test step in accordance with the customer complaint.

<u>Section</u>	<u>Coordinates</u>
Structure of the microfiche	A 1
Special features	A 2
Rapid diagnostic chart for universal- test adapter	A 3 - A 15
Test specification	A 16 - A 17
Electrical connection diagram (until 7.85)	A 18 - A 19
Electrical lead diagram (from 8.85).....	A 20 - A 21
Fuel line diagram	A 22 - A 23
Overview diagram, knock control and exhaust-gas turbocharger	A 24 B 1 - B 2
Lambda closed-loop control (operation).....	B 3 - B 4
Idle speed control (operation)	B 5 - B 6
Test equipment and tools.....	B 7 - B 11
Installation position of components.....	B 12 - B 15
General instructions.....	B 16



Table of Contents (Continued)

<u>Section</u>	<u>Coordinates</u>
Trouble-shooting chart	C 1 - C 8
Detailed trouble-shooting chart	C 3 - C 4
Direct trouble-shooting chart	C 5 - C 8
 Test chart for universal test adapter	C 9 - F 7
 Fuel pressure testing (In-tank electric fuel pump not operating, removal and installation of electric fuel pump, pump fuse, pressure regulator, fuel pressure remains constant, removal and installation of non-return valve).....	F 8 - G 4
 <u>Customer Complaint</u>	
<u>STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS POORLY</u>	G 5 - G 14
Start control	G 7 - G 10
Idle actuator	G 11 - G 12
Hot start	G 11 - G 12
Hose lines, electric lead connections, and leak test	G 13 - G 14



Table of Contents (Continued)

<u>Section</u>	<u>Coordinates</u>
<u>ENGINE STARTS BUT THEN</u>	
<u>DIES</u>	G 15 - H 2
Idle actuator	G 17 - G 18
Solenoid-operated injection valves (sealing)	G 19 - G 22
Hot-wire air-mass sensor	G 23 - G 24
Hose lines, electric lead connections, and leak test	H 1 - H 2
<u>UNEVEN ENGINE IDLE, INCORRECT</u>	
<u>IDLE SPEED</u>	H 3 - H 22
Throttle-valve adjustment	H 5 - H 6
Throttle-valve switch (adjustment)	H 7 - H 8
Throttle-valve damper (adjustment)	H 9 - H 10
Idle speed and integrator adjustment, (CO content)	H 11 - H 12
Idle actuator	H 13 - H 14
Checking solenoid-operated injection valves	H 15 - H 16
Replacing solenoid-operated injection valves	H 17 - H 18
Hose lines, electric lead connections, and leak test	H 19 - H 20
Idle speed and integrator adjustment (CO content) repeat	H 21 - H 22



Table of Contents (Continued)

<u>Section</u>	<u>Coordinates</u>
<u>POOR THROTTLE TAKE-UP</u>	J 1 - J 14
Throttle-valve adjustment	J 3 - J 4
Throttle-valve switch (adjustment)	J 5 - J 6
Idle actuator	J 5 - J 6
Throttle-valve damper (adjustment)	J 7 - J 8
Hot-wire air-mass sensor	J 9 - J 10
Hose lines, electric lead connections, and leak test	J 11 - J 12
Idle speed and integrator adjustment (CO content)	J 13 - J 14
 <u>ENGINE MISSES UNDER ALL OPERATING CONDITIONS</u>	 J 15 - K 10
Electric fuel pump delivery quantity	J 17 - J 20
Voltage peaks	J 19 - J 20
Control unit	J 19 - J 20
Coughing in overrun, throttle valve, and throttle-valve switch adjustment	J 21 - J 22
Solenoid-operated injection valves (electrical and mechanical testing)	J 23 - J 24
Replacing solenoid-operated injection valves	K 1 - K 2
Hot-wire air-mass sensor	K 5 - K 6
Hose lines, electric lead connections, and leak test	K 7 - K 8
Idle speed and integrator adjustment (CO content)	K 9 - K 10
 <u>FUEL CONSUMPTION TOO HIGH</u>	 K 11 - K 24
Solenoid-operated injection valves (sealing)	K 13 - K 16
Solenoid-operated injection valves, mechanical testing	K 15 - K 16
Replacing solenoid-operated injection valves	K 17 - K 20
Hot-wire air-mass sensor	K 21 - K 22
Idle speed and integrator adjustment (CO content)	K 23 - K 24



Table of Contents (Continued)

Section

Coordinates

INSUFFICIENT MAXIMUM

<u>POWER OR MAXIMUM SPEED</u>	L 1 - L 16
Throttle-valve adjustment	L 3 - L 4
Air filter	L 5 - L 6
Full-load enrichment in control unit	L 5 - L 6
Electric fuel pump delivery quantity	L 7 - L 10
Exhaust turbo-supercharger and knock control (APC system)	L 9 - L 12
Hot-wire air-mass sensor	L 13 - L 14
Hose lines, electric lead connections, and leak test	L 15 - L 16

CO ADJUSTMENT AT IDLE TOO LOW

<u>OR TOO HIGH</u>	M 1 - M 18
Idle actuator	M 3 - M 4
Start control	M 5 - M 8
Solenoid-operated injection valves (sealing)	M 9 - M 12
Hot-wire air-mass sensor	M 13 - M 14
Leak test	M 15 - M 16
Idle speed and integrator adjustment (CO content)	M 17 - M 18

TECHNICAL BULLETINS	N 1 - N 9
---------------------------	-----------

MOTOR VEHICLE SERVICE

INFORMATION	N 10 - N 19
-------------------	-------------

© 1989 Robert Bosch GmbH Automotive Equipment -
After-Sales Service, Department for Technical
Publications KH/VDT, Postfach 50, D-7000 Stuttgart 1.

Published by: After-Sales Service Department for
Training and Technology (KH/VSK). Press date: 1.1989
Please direct questions and comments concerning the
contents to our authorized representative in your
country.

This publication is intended solely for the use of the
Bosch After-Sales Service Organization, and may not be
passed on to third parties without our consent.

Microfilmed in the Federal Republic of Germany.

Microphotographié en République Fédérale d'Allemagne.

